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## 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 <sup>1</sup>

- J. L. Lesmeister,<sup>2</sup> 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 #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



Table 1. Effect of calving period on ADG, reproduction, and first calf characteristics of herifer progeny.           Item         Calving period         P           8 th         0.1         0.4         44         P           9 th         0.1         0.4         44         P         1         2           1 calf bursh BW, kg         36 <sup>4</sup> 37 <sup>4</sup> 38 <sup>4</sup> 0.70         <0.001           Calf words BW, kg         219 <sup>4</sup> 213 <sup>5</sup> 197 <sup>4</sup> 4.90         0.003           Preventing ADG, kg/d         0.39         0.41         0.41         0.03         0.07         0.001           Predereding BW, kg         296 <sup>4</sup> 292 <sup>5</sup> 276 <sup>5</sup> 4.18         <0.001         0         +16           Cycling berginning of breeding, 5%         70 <sup>4</sup> 0.77 <sup>4</sup> 0.04 <sup>4</sup> 0.03         Preparacy rate, 5%         90 <sup>4</sup> 86 <sup>6</sup> 78 <sup>5</sup> 5.33         <0.001         1         1         2         0         +16         1         1         2         0         4.82         467         4.82         467         4.82         467         4.82         467         4.82         467         4.84         4.82         4.65         <	riod 3 +36	
Table 1. Effect of calving period         Table 1. Effect of calving period         Calving period         Term       Calving period         n       1 2 3 SEM       P         B       Bith Date, julian d       Calving period       1       Calving period         1       2       3 SEM       P         B       Bith Date, julian d       Calving period       1       2         Calving bW, kg       202       -0.001         Calving period       0       +16         Calving bW, kg       203       0.001         Child       0       +16         Preducing BW, kg       205       -0.001         Child       0       +16         Preducing BW, kg       205       -0.001         Child       -0.001       -0.001         Child       -0.001 <th co<="" th=""><th>riod 3 +36</th></th>	<th>riod 3 +36</th>	riod 3 +36
Item         1         2         3         EM         P           n         651         304         66         64         64         66         60         64         66         60         64         66         66         64         66 <td>riod 3 +36</td>	riod 3 +36	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	3 +36	
Birth Dare, Julian d       177*       93*       11's       2.02       <0.001	<b>3</b> +36	
Calf brith BW, kg       36 <sup>4</sup> 37 <sup>5</sup> 38 <sup>8</sup> 0.70       <0.001	+36	
Calf vexning BW, kg       219 <sup>4</sup> 213 <sup>3</sup> 197 <sup>4</sup> 4.90       0.03         Prevexning ADG, kg/d       0.33       0.86       0.04       0.10         Prebreeding ADG, kg/d       0.39       0.41       0.03       0.07         Prebreeding ADG, kg/d       0.39       0.41       0.03       0.07         Prebreeding ADG, kg/d       0.39       0.41       0.03       0.07         Prebreeding ADG, kg/d       0.72 <sup>4</sup> 0.74 <sup>4</sup> 0.001         Cycling beginning of breeding, %       0.72 <sup>4</sup> 0.74 <sup>4</sup> 0.04       0.03         Pregunory diagnosis BW, kg       3.73 <sup>3</sup> 3.71 <sup>4</sup> 3.53 <sup>5</sup> 5.33       <0.001	+36	
Prevening ADG, kg/d         0.83         0.83         0.84         0.10           Prevening ADG, kg/d         0.39         0.41         0.03         0.07           Prevening ADG, kg/d         296*         292*         276         4.18         <0.01	+36	
Prebreeding 200, kg/d 0.39 0.41 0.41 0.03 0.07 Prebreeding 200, kg/d 202 276' 4.18 -0.001 Cycling beginning of breeding, % 70' 58' 39' 9.35 -0.001 Breeding ADC, kg/d 0.72' 0.74' 0.75' 0.44 0.03 Pregnancy diagnosis BW, kg 373' 371' 358' 5.33 -0.001 Pregnancy rate, % 90' 66' 78' 5.42 0.001 Pregnancy rate, % 90' 66' 78' 5.43 -0.001 Pregnancy rate, % 90' 70' 5.8	100	
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Cycling beginning of breeding, % 70° 58° 39° 933 <0001 Breeding ADOK kg/d 0772° 074° 004 003 Pregnancy diagnois 8W, kg 373° 371° 378° 562 002 Precalving BW, kg 429 430 418 665 006 First calf burth date, juliand 68° 73° 75° 2.03 <0001 Calved in first 21.4% 61° 69° 65° 8.441 <001		
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First caliform date, julian d 66 <sup>4</sup> 73 <sup>5</sup> 75 <sup>6</sup> 2.03 < 0.001 Calved in first 21 d, % 81 <sup>4</sup> 69 <sup>5</sup> 65 <sup>5</sup> 8.41 < 0.01	607	
Calved in first 21 d. % S1 6% 6% 8.41 <0001 Season % 70 58		
	00	
First call birth BW km $36^{\circ}$ $37^{\circ}$ $38^{\circ}$ $0.69 < 0.001$	39	
Assisted births % 23 29 33 837 0.26		
$P_{\rm vistoriascorr}^2$ 129 140 134 011 018 0/ 00 96	70	
Cow weaning BW, kg 419 422 422 7.71 0.68 70 90 00	<u> </u>	
Calf wearing BW, kg 193 189 186 5.17 0.10		
Pregnancy rate after first calf, % 93 90 84 6.61 0.20		
<sup>1</sup> 1 = calved in the 1 <sup>2</sup> 1 d, 2 = calved in the 2 <sup>44</sup> 2 l, 3 = calved in the 3 <sup>45</sup> 2 l d of the spring calving period. <sup>2</sup> Scoring system 1 to 5: 1 = no assistance; 2 = easy pull; 3 = mechanical pull; 4 = hard mechanical pull; 4 = 5 Caesarean section.		

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	Table 1. Effect of calving period on ADG, re	production, and first	calf characteris	tics of heifer p	rogeny			-		onna	100	
			Calving period	1 <sup>1</sup>								
	Item	1	2	3	SEM	P				Calv	ing Po	rio
	n Birth Date julian d	051 77 <sup>a</sup>	03 <sup>b</sup>	1130	2.02	<0.001				Carv	шд ге	ПО
	Calf birth BW kg	36*	376	380	0.70	<0.001						
	Calf wearing BW kg	219*	2136	197	4 90	0.03				1	2	
	Preweaning ADG, kg/d	0.83	0.83	0.86	0.04	0.10						
	Prebreeding ADG kg/d	0.39	0.41	0.41	0.03	0.07						
	Prebreeding BW, kg	296 <sup>a</sup>	292 <sup>b</sup>	276 <sup>c</sup>	4.18	< 0.001			oolf dovo	0	15	
	Cycling beginning of breeding. %	70 <sup>a</sup>	58 <sup>b</sup>	39 <sup>c</sup>	9.35	< 0.001			call, uays	U	- TO	
	Breeding ADG, kg/d	0.72ª	0.74 <sup>ab</sup>	0.77 <sup>b</sup>	0.04	0.03						
	Pregnancy diagnosis BW, kg	373 <sup>a</sup>	371*	358 <sup>b</sup>	5.33	< 0.001			4 -1 0/	04	00	
	Pregnancy rate, %	90 <sup>*</sup>	86*	78 <sup>b</sup>	5.62	0.02			i davs. %	8 N	69	
	Precalving BW, kg	429	430	418	6.65	0.06			, <b>,</b>	-		
	First calf birth date, julian d	68 <sup>a</sup>	73 <sup>b</sup>	75 <sup>b</sup>	2.03	< 0.001						
	Calved in first 21 d, %	81*	69 <sup>b</sup>	65 <sup>b</sup>	8.41	< 0.01			st calf the	425	416	4
	First calf birth BW, kg	36 <sup>a</sup>	37 <sup>b</sup>	38 <sup>b</sup>	0.69	< 0.001				720	-10	
	Assisted births, %	23	29	33	8.37	0.26		_				
	Dystocia score <sup>2</sup>	1.29	1.40	1.34	0.11	0.18			st colf 0/	02	00	
	Cow weaning BW, kg	419	422	422	7.71	0.68				93	90	
	Calf weaning BW, kg	193	189	186	5.17	0.10						
	Pregnancy rate after first calf, %	93	90	84	6.61	0.20	Moone diff	r (D < 0)	05)			
	1 = calved in the 1st 21 d, 2 = calved in the 2	nd 21 d, 3 = calved in	the 3 <sup>rd</sup> 21 d of	the spring cal	ving period.		means une	$\exists ( \Box \geq 0.$	00)			
	<sup>2</sup> Scoring system 1 to 5: 1 = no assistance; 2 =	easy pull; 3 = mech	anical pull; 4 =	hard mechani	cal pull; and	5 = Caesarean	Means do r	not differ	(P > 0.05)			
	section.						ineuris de l	iot anici	(1 0.00)			
	abe Means without a common superscript diffe	$r (P \le 0.05).$										

## 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, Ib	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)

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,\*<sup>1</sup> 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

SIRES

SELECT

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

#### Objectives:

Determine differences in lifetime prod'n among:

- 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 Al from 1991 to 2010 (6,693 records) Conceived to Al or NS beginning 10 d later

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

### Yearling heifers

- Al'd 3 to 4 wks before cows
- Al'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 Al'd to outside and ranchproduced 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



# 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 Al
- There was not a non-synchronized control group
- Full potential merits of using elite sires through AI were minimized



# BIF 2013 Producer mmittee Breakout

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	that conceived to AI as a yearlin \$922 greater ( $P < 0.0001$ ) than of females that conceived to NS yearling. Because heifers that co ceived to AI as a yearling reason by more, we conclude the differe in lifetime revenue under all 4 pu scenarios between the AI and NY yearling heifer groups was attrib	g was hat as a a- 1 438 nce ice ice ited	weight of C-NS fem < 0.0001) compare C-AI females but n 1.10) from H-NS fe However, there wer > 0.10 among fem H-NS, and C-AI ch rearling weight. The mccs ( $P > 0.10$ ) in	nales was lower ( $P$ d with H-AI and not different ( $P >$ males (Table 4). re no differences ( $F$ ales in the H-AI, assifications for nere were no differ- i birth weight or	were present an tions for any of (Table 5). This difference in life among dam clas Prebreeding <i>n</i> mal effect on he (Funston and D Funston et al., 2	yong dam classifica- the 4 price scenarios is due to the lack of time weight weaned sifications. ate of gain has mini- ifer pregnancy rate eutscher, 2004; 2011), which sug-	Life <i>Heife</i>	me Rev s <i>Conce</i> l	enue F iving Ea	Producec arly or Lat
	Table 3. Least squares mean or natural service (NS) as a y Conception classification	s ± SE fo earling <sup>13</sup> n	r lifetime revenue ; Actual price	produced (\$/femal Avg. price	e) from females tha Max. var. price	at conceived to AI Min. var. price			n =	Lifetime Revenue
	Conceived to AI Conceived to NS Means within a column without a "Interime revenue produced per fee to 2010. <sup>3</sup> Actual price = actual market price (1991 to 2010) for each weight du	871 302 common nale was for the sa sion was	2,483° ± 56.6 1,561° ± 96.9 superscript differ (P < alculated using prices ne year a calf was pro ised; max. var. price =	2,334 <sup>3</sup> ± 51.3 1,376 <sup>9</sup> ± 92.8 0.0001). s from Torrington Live oduced was used; avg = difference between 1	2,302 <sup>9</sup> ± 50.4 1,364 <sup>9</sup> ± 91.2 stock Market LLC (Torr ). price = average price the average price for e	2,359 ± 52.0 1,385 <sup>b</sup> ± 94.3 ington, WY) from 1991 e across all years ach weight division	Concei to Al	ed early	871	\$2,483ª
	and the average price for the 1821 difference between the average pr by 0.25 and added to the base price	o 204 kg v ice for eac e was use	veight division multipli h weight division and i d. Prices were not ad	ed by 2.0 and added the average price for justed for inflation.	to the base price was u the 182 to 204 kg weig	ised; min. var. price = ht division multiplied	Concei to NS	ed later	302	\$1,561 <sup>b</sup>
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# Principle #7 (French)

The Manual And Conceive to natural service.

## Offspring of an Early vs. Late Conception

H-AI	female born to a heifer and early (via Al 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)

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erformance of its calves by dar					Lifetime productivi	tu of superspirated heaf fo	males	7		resulti	Ig nom L		
ormance of calves	~				Digetime production	sy oj synchronisca ocij je	mano						
Age at Lifetime weight weaning (d) weared (kg)	<u> </u>		Table 5. Least squa	res means ± S	E for lifetime reve	enue (\$/female) produc	ed for females by	dam classification1.2				Lifetime	
188 ± 0.6         974 ± 57.3           186 ± 1.5         870 ± 111.7           186 ± 0.4         966 ± 29.7           187 ± 0.5         989 ± 43.0	E.J.		Dam classification <sup>3</sup>	n	Actual price	Avg. price	Max. var. price	Min. var. price			n =	Revenue	
er and the offspring of a natural serv to the offspring of an NS mating, of AL			H-AI H-NS C-AI C-NS	195 40 618 320	2,223 ± 136.5 1,949 ± 265.5 2,253 ± 70.9 2,313 ± 102.2	2,124 ± 124.0 1,901 ± 240.6 2,092 ± 64.4 2,168 ± 92.5	2,083 ± 121.8 1,878 ± 236.3 2,068 ± 63.2 2,139 ± 90.9	2,155 ± 125.9 1,917 ± 244.3 2,110 ± 65.4 2,188 ± 93.9			195	\$2,223	
			<sup>1</sup> Means do not differ (P <sup>2</sup> Actual price = actual m (1991 to 2010) for each and the average price f	> 0.10). arket price for th weight division or the 182 to 204	e same year a calf w was used; max. var.	vas produced was used; av price = difference between nultiplied by 2.0 and added	rg, price = average pr the average price for to the base price wa	ce across all years each weight division s used: min var price =			40	\$1,949	
Though study, progna of estr sarlier batter status vuluab on the lifetim			difference between the by 0.25 and added to th <sup>3</sup> H-AI = female born to offspring of a natural se	average price fo e base price wa a primiparous he rvice (NS) matin	r each weight division s used. Prices were n ifer and the offspring g; C-AI = female born	n and the average price for not adjusted for inflation. I of an AI mating; H-NS = fe n to a multiparous cow and	r the 182 to 204 kg w emale born to a primip I the offspring of an A	eight division multiplied varous heifer and the mating; C-NS = female			618	\$2,253	
the weating, we the confirm the importan- tion in the coul- ury rate coul- ury rate coul- torn (1.a., of ther data ther data ther data chastfleer of half offset of half offset of half offset of half			born to a multiparous o	ow and the offsp	ring of an NS mating						320	\$2,313	
upper and rev nod by the co ces of befor 1 d encourage atton to pro- tation to pro- dur) replaces dur) replaces dur) replaces dur) replaces dur) replaces dur) replaces dur) replaces dur) replaces dur) replaces dur age at Al provious res provious res			nancial support for this as the John E. Rouse C University BIC for the	study, as well colorado State r cooperation.	Dunn, T. G., and Nutrition and th ewe, sow and cov 2):29. (Abstr.)	d C. C. Kaltenbach. 1980. e postpartum interval of the w. J. Anim. Sci. 51(Suppl.	e 55:177–184. Johnson, S. K., and comparisons	a Angus herd. Anim. Prod. and R. Jones. 2004. Costs of estrous synchroniza-					
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- 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

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



