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Maximizing Use of an Extension Beef Cattle Data Set: Part 1—Calving Distribution

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Abstract

Previously, we created a 20-year data set, CHAPS20Y, from historical data generated by Cow Herd Appraisal Performance Software, a beef management program. In this article, we describe CHAPS20Y calving distributions, including yearly means and 20-year averages. Yearly mean calving distributions are consistent over the 20-year period, but yearly herd minimum and maximum values vary greatly. Herd-to-herd differences in nutrition, breed, environment, and management may explain this variation. We used CHAPS20Y as a tool for understanding calving distribution and increasing the Extension knowledge base. Extension professionals can use this knowledge to help beef producers set and achieve their herd management goals.

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Introduction

Cow Herd Appraisal Performance Software (CHAPS) is an Extension-developed beef herd management program that has been used by producers for over 30 years (Ramsay, Hulsman Hanna, & Ringwall, 2016). The program has allowed the CHAPS team at the North Dakota State University Extension Service to assemble substantial historical beef herd data that include calving distribution, reproduction, and growth data. Previously, we reported a process for selecting herds from CHAPS historical data to create CHAPS20Y, a 20-year data set spanning from 1994 through 2013, as an Extension tool for understanding trends in beef production (Ramsay et al., 2016).

In this article, we describe calving distribution data obtained from CHAPS20Y, including yearly means and the averages of the yearly means (20-year averages). Additionally, we describe linear trends over time based on the 20-year averages. Those of us working in applicable areas of Extension can use knowledge gained from CHAPS20Y calving distribution data to help producers set relevant herd management goals and adjust management plans as needed to achieve those goals.

Describing Calving Distribution Data

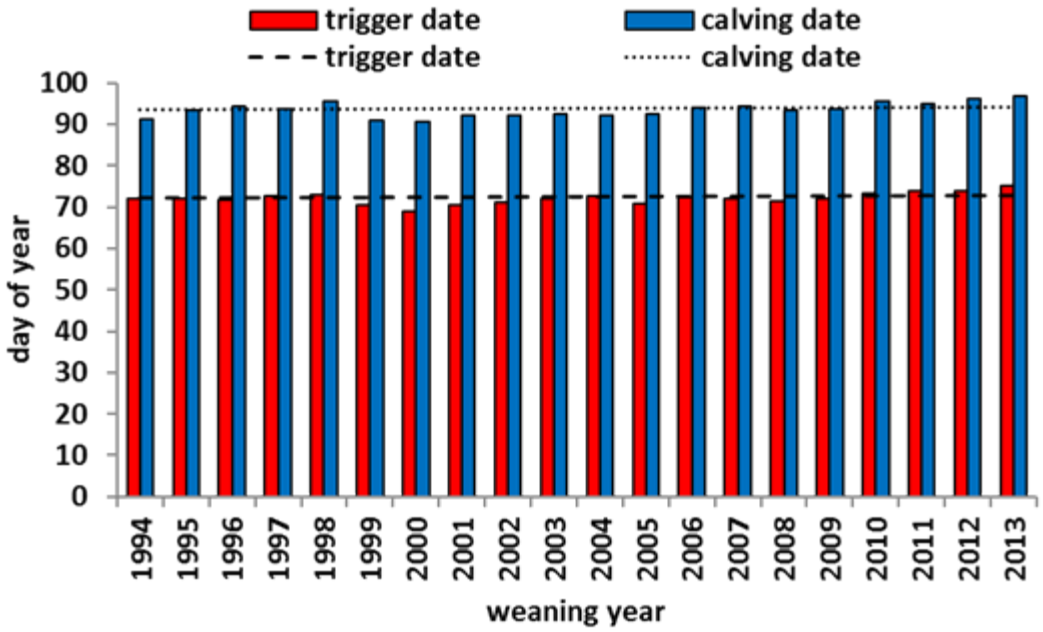
Trigger and Calving Dates

CHAPS defines the date that the third mature cow in a herd calves as the trigger date (Day 0), or the start of the calving period for the herd. We report the trigger date and each calving date on a day-of-year calendar, ranging from 1 to 365(366) days, to understand when calving occurs during the year.

Yearly mean trigger dates for CHAPS20Y ranged from day 69 to day 75 (March 10–17), with a 20-year average of day 72 (March 13) (Figure 1). Yearly mean calving dates ranged from day 91 to day 97 (April 1–8), with a 20-year average of day 94 (April 4) (Figure 1).

Figure 1.

Yearly Mean Trigger and Calving Dates (Day of Year) with 20-Year Average Trend Lines

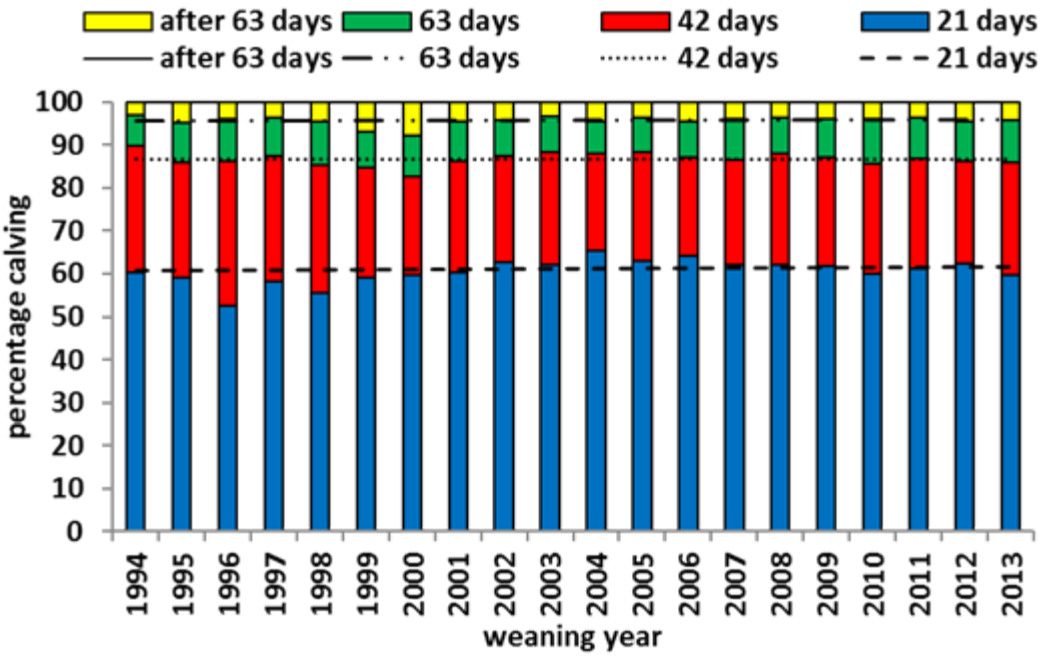


Overall Calving Distribution

CHAPS defines calving distribution as the percentages of individuals calving by certain times during the calving period (Ramsay et al., 2016). Each year, for each herd, CHAPS calculates calving distributions by first determining the number of days between the trigger date and each individual's calving date and then determining the percentages of individuals in the herd that calved within 21 days, within 42 days, within 63 days, and after 63 days relative to the trigger date (Day 0). Figure 2 shows cumulative yearly calving distributions with 20-year average trend lines. Yearly mean calving distributions ranged from 53% to 65% at 21 days, with a 20-year average of 61%; 83% to 90% at 42 days, with a 20-year average of 87%; 92% to 97% at 63 days, with a 20-year average of 96%; and 3% to 8% after 63 days, with a 20-year average of 4%.

Figure 2.

Cumulative Yearly Mean Calving Distribution with 20-Year Average Trend Lines



Heifer and Mature Cow Calving Distribution

CHAPS also calculates the calving distributions of heifers (cow age ≤ 2 years) and mature cows separately. Heifers can calve early, prior to the trigger date (Day 0), because CHAPS bases the trigger date on the calving dates of only mature cows. Cumulative yearly calving percentages are shown for heifers in Figure 3 and for cows in Figure 4. The percentages of heifers that calved early ranged from 24% to 41%, with a 20-year average of 36%. For heifers that did not calve early, yearly mean calving distributions ranged from 69% to 77% at 21 days, with a 20-year average of 73%, and 82% to 93% at 42 days, with a 20-year average of 88%. The percentage of mature cows that calved by 21 days ranged from 48% to 63%, with a 20-year average of 57%. By 42 days, 82% to 88% of cows calved, with a 20-year average of 86%.

Figure 3.

Cumulative Yearly Mean Heifer Calving Distribution with 20-Year Average Trend Lines

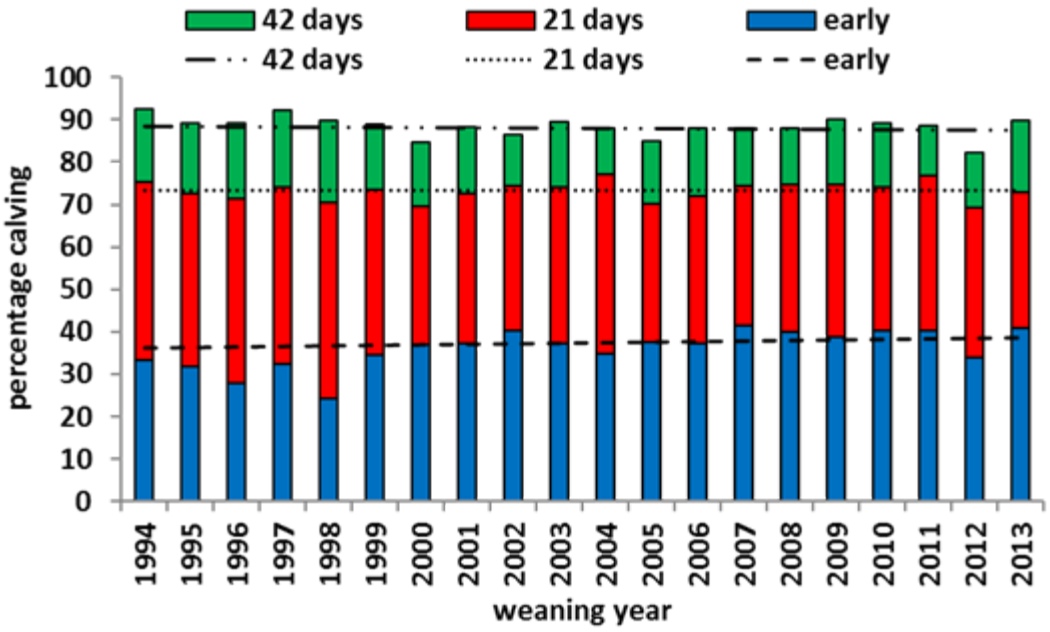
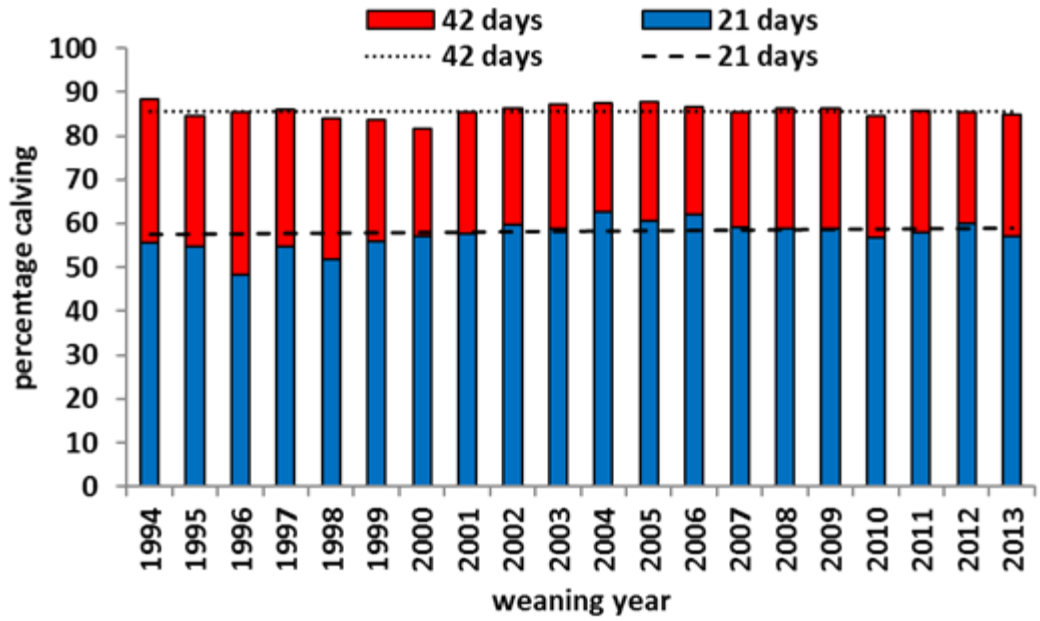


Figure 4.

Cumulative Yearly Mean Cow Calving Distribution with 20-Year Average Trend Lines



Heifer Calving Distribution Versus Mature Cow Calving Distribution

Heifer calving distribution and mature cow calving distribution differed over time. Almost 20% more heifers calved by 21 days compared to mature cows (Figure 5), whereas the percentages of heifers and mature cows that calved by 42 days were similar (Figure 6).

Figure 5.

Yearly Mean Calving Distribution at 21 Days: Heifer Versus Cow, with 20-Year Average Trend Lines

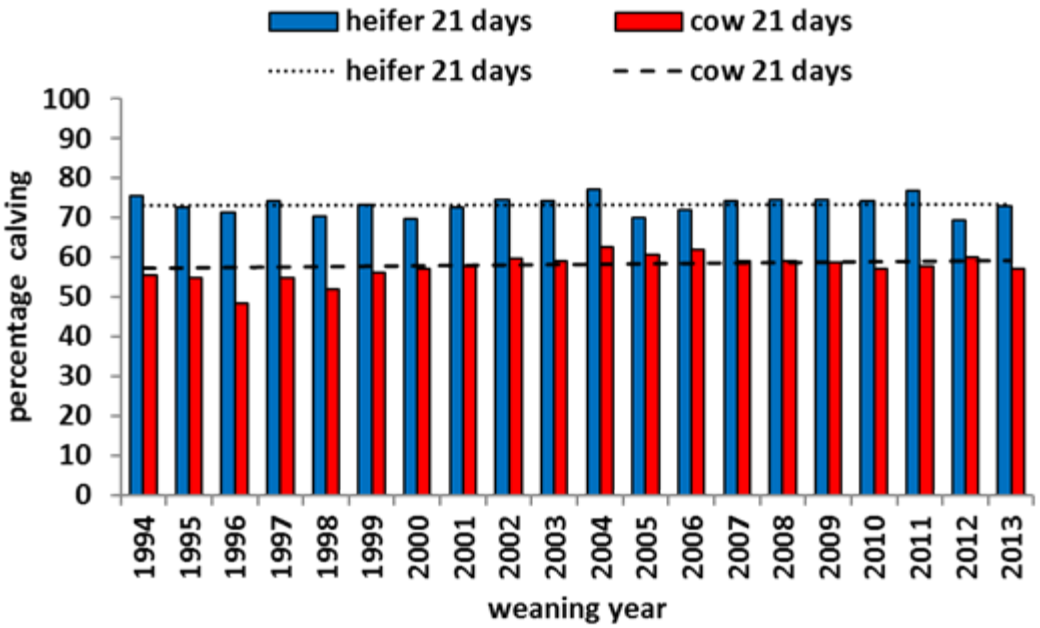
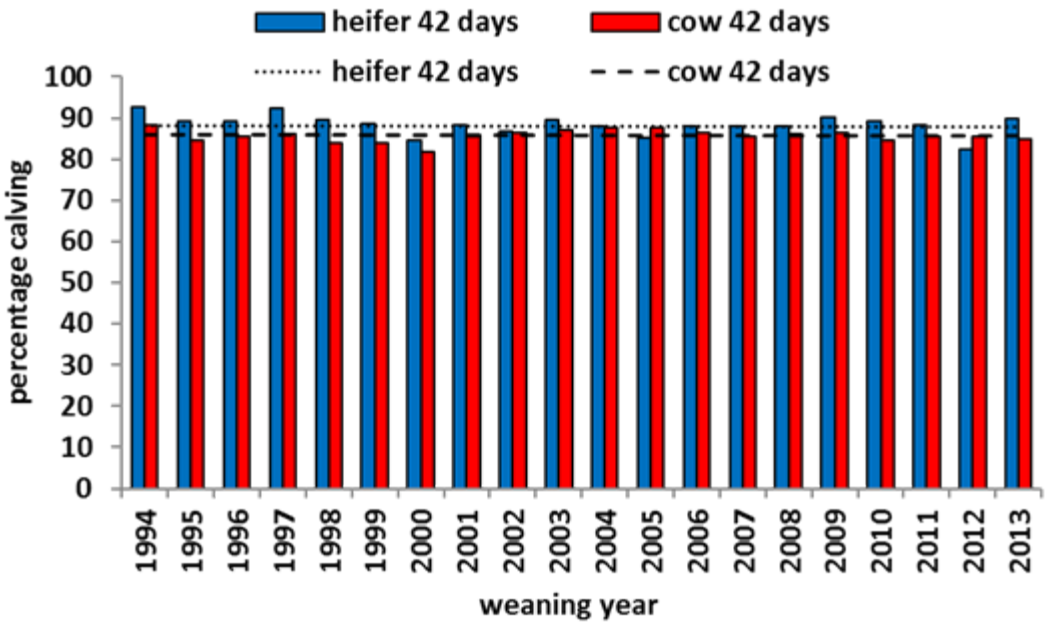


Figure 6.

Yearly Mean Calving Distribution at 42 Days: Heifer Versus Cow, with 20-Year Average Trend Lines



Yearly Minimums and Maximums

To better demonstrate the herd-to-herd variation in the CHAPS20Y data set, we present yearly herd minimums and maximums for trigger and calving dates (calendar dates) (Table 1) and yearly herd minimum and maximum calving distribution percentages for all heifers and cows (Table 2), for heifers only (Table 3), and for mature cows only (Table 4).

Table 1.

Minimum and Maximum Calving and Trigger Calendar Dates

	Trigger date		Calving date	
Year	**Min.**	**Max.**	**Min.**	**Max.**
1994	Feb 13	Apr 9	Mar 7	Apr 28
1995	Jan 27	Apr 8	Mar 8	Apr 28
1996	Feb 18	Mar 30	Mar 6	Apr 27
1997	Feb 10	Apr 10	Mar 6	Apr 28
1998	Feb 8	Apr 11	Mar 4	Apr 26
1999	Feb 6	Apr 12	Feb 23	Apr 29
2000	Feb 6	Apr 11	Feb 25	Apr 24
2001	Jan 25	Apr 13	Mar 1	Apr 29
2002	Jan 24	Apr 12	Mar 1	Apr 25
2003	Feb 2	Apr 12	Mar 6	May 3
2004	Feb 11	Apr 11	Mar 2	Apr 29
2005	Feb 7	Apr 15	Feb 28	Apr 27
2006	Feb 8	Apr 14	Mar 7	Apr 30
2007	Feb 12	Apr 14	Feb 25	May 11
2008	Feb 8	Apr 21	Mar 8	May 16
2009	Feb 1	Apr 19	Mar 10	May 14
2010	Feb 2	Apr 15	Mar 8	May 14
2011	Feb 10	Apr 29	Mar 10	May 8
2012	Feb 7	Apr 19	Mar 6	May 17
2013	Feb 8	Apr 22	Mar 6	May 11

Table 2.

Minimum and Maximum Calving Distribution Percentages: All Heifers and Cows

	21 days		42 days		63 days		> 63 days	
Year	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**
1994	32	73	79	97	88	100	0	12
1995	4	78	10	97	62	100	0	38

1996	14	78	68	96	86	100	0	14
1997	26	80	62	97	84	100	0	16
1998	20	77	63	95	77	100	0	23
1999	4	91	4	99	11	100	0	89
2000	2	90	2	100	2	100	0	98
2001	1	88	6	100	66	100	0	34
2002	2	96	30	99	77	100	0	23
2003	6	91	46	99	75	100	0	25
2004	3	89	3	100	3	100	0	98
2005	6	93	11	99	68	100	0	32
2006	12	93	36	100	71	100	0	29
2007	1	100	43	100	81	100	0	19
2008	4	88	56	100	78	100	0	22
2009	5	86	15	99	62	100	0	38
2010	5	82	29	99	76	100	0	24
2011	16	89	57	100	86	100	0	14
2012	12	88	37	100	81	100	0	19
2013	4	86	38	99	82	100	0	18

Table 3.

Minimum and Maximum Calving Distribution

Percentages: Heifers

	Early		21 days		42 days	
Year	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**
1994	0	90	40	100	76	100
1995	0	86	14	100	60	100
1996	0	89	22	97	67	100
1997	0	89	27	100	56	100
1998	0	91	0	100	0	100
1999	0	92	27	100	69	100
2000	0	100	0	100	0	100
2001	0	100	0	100	0	100
2002	0	100	0	100	0	100

2003	0	94	14	100	64	100
2004	0	97	0	100	0	100
2005	0	100	0	100	0	100
2006	0	100	0	100	32	100
2007	0	100	4	100	67	100
2008	0	100	0	100	58	100
2009	0	97	3	100	28	100
2010	0	100	0	100	0	100
2011	0	93	22	100	57	100
2012	0	96	0	100	0	100
2013	0	94	0	100	62	100

Table 4.

Minimum and Maximum Calving Distribution Percentages: Cows

	21 days		42 days	
Year	**Min.**	**Max.**	**Min.**	**Max.**
1994	12	75	63	99
1995	5	78	13	96
1996	9	77	62	95
1997	22	76	54	98
1998	10	78	61	95
1999	7	89	7	99
2000	1	88	1	100
2001	1	89	4	100
2002	3	96	29	99
2003	3	89	45	100
2004	3	91	3	100
2005	6	99	12	99
2006	7	100	29	100
2007	1	100	38	100
2008	2	86	54	100

2009	2	86	12	98
2010	2	81	19	99
2011	1	86	47	100
2012	1	87	27	100
2013	4	87	32	99

Using CHAPS20Y Calving Distribution Data to Increase Extension Knowledge

We have shown yearly mean trigger dates, calving dates, and calving distributions to be consistent over the 20-year period, as indicated by horizontal linear trend lines in Figures 1–6. However, yearly minimums and maximums vary greatly, indicating herd-to-herd variability. Although it is not our intention to determine cause and effect, we outline here possible causes of this variation to expand the Extension knowledge base, providing information Extension professionals can use to help producers manage their herds to meet their goals.

Numerous factors affect calving distribution and can result in variability within and between herds. Proper nutrition is important to successful reproduction, and producers should evaluate nutrition practices when calving is not timely (Hess et al., 2005). Breed and genetics affect the timing and reproductive capacity of beef cattle (Gregory, Cundiff, & Koch, 1991). Cool wet springs and warm wet summers, associated with increased forage production, tend to increase cow-calf production (Reeves et al., 2015). Hot weather and drought can cause heat stress and impair reproduction (Carroll & Hoerlein, 1966; St-Pierre, Cobanov, & Schnitkey, 2003). The age of a cow is also an important consideration. First-calf heifers often require more time than older cows to recover from calving before subsequent rebreeding (Ringwall, Berg, & Boggs, 1992).

Timely calving ensures ample time for rebreeding, allowing each cow to produce a calf every 365 days (Ringwall, 2014). Ideally, 60% of heifers and cows in a herd should calve in the first 21 days of the calving season, and 86% in the first 42 days (Ringwall, 2013). Producers may need to adjust breeding plans to achieve this goal; adjustments may include culling of late-calving cows (Ringwall, 2014).

Conclusion

Using data from CHAPS20Y, we have added to the Extension knowledge base and broadened Extension thinking on beef cattle reproductive management. We have outlined the numerous factors that affect calving distribution. With this knowledge, Extension professionals can help producers set herd management goals and adjust management plans to achieve those goals.

Acknowledgments

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