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Jennifer M. Ramsay
North Dakota State University, jennifer.m.ramsay@ndsu.edu

Lauren L. Hulsman Hanna
North Dakota State University, lauren.hanna@ndsu.edu

Kris A. Ringwall
North Dakota State University, kris.ringwall@ndsu.edu

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Abstract

One goal of Extension is to provide practical information that makes a difference to producers. Cow Herd Appraisal Performance Software (CHAPS) has provided beef producers with production benchmarks for 30 years, creating a large historical data set. Many such large data sets contain useful information but are underutilized. Our goal was to create a 20-year data set (CHAPS20Y) to examine trends in beef production from 1994 to 2013. In this article, we describe the CHAPS program and the process used to select herds for CHAPS20Y. We hope to publish additional related articles that will examine trends in calving distributions, reproduction, and growth and discuss implications for producers and Extension.

Jennifer M. Ramsay
Data Specialist
Dickinson Research Extension Center
North Dakota State University
Dickinson, North Dakota
jennifer.m.ramsay@ndsu.edu

Lauren L. Hulsman Hanna
Assistant Professor
Department of Animal Sciences
North Dakota State University
Fargo, North Dakota
lauren.hanna@ndsu.edu

Kris A. Ringwall
Extension Livestock Specialist and Director
Dickinson Research Extension Center
North Dakota State University
Dickinson, North Dakota
kris.ringwall@ndsu.edu

Introduction

The North Dakota State University (NDSU) Extension Service and North Dakota Beef Cattle Improvement Association developed Cow Herd Appraisal Performance Software (CHAPS) as a management tool (Ringwall, 2004; Ringwall, Berg, & Boggs, 1992). Since 1985, CHAPS has been used to collect, store, and evaluate beef production data to establish reproduction and production benchmarks.

CHAPS is a herd management software available through the NDSU Extension Service. Individual cow-calf data from individual herds are managed in Microsoft Access databases. CHAPS calculates annual herd benchmarks for calving distribution, reproduction, and growth. The benchmarks are calculated through the use of equations derived from an integrated resource management standardized performance analysis (McGrann, 2010) and Beef Improvement Federation guidelines. The CHAPS data set is checked annually for errors, using SAS procedures (Ramsay, Hulsman Hanna, & Ringwall, 2014).

In addition to calculating individual herd benchmarks, each year the CHAPS team calculates overall benchmarks: 5-year rolling averages of yearly benchmark values from selected CHAPS herds. Historically, herds selected for inclusion in the yearly benchmarks have had a minimum of 50 cows exposed to at least one bull and have 3 consecutive years of data in the CHAPS program. Each year the overall CHAPS benchmarks are calculated by averaging the benchmark values from the 5 previous years. The rolling average benchmarks buffer against sudden changes in benchmark traits (Ringwall, 2004).

Since 2000, the overall benchmarks have been published annually on the CHAPS website (https://www.ag.ndsu.edu/DickinsonREC/chaps-software-1) and discussed in BeefTalk (http://www.ag.ndsu.edu/news/columns/beeftalk), an NDSU Extension Service agricultural news column. The 2015 benchmarks are displayed in Table 1. Producers compare their yearly herd benchmarks to overall benchmarks to identify potential management issues.

Table 1.

CHAPS Benchmarks, 5-Year Rolling Averages (2015)

Benchmark trait	Value	Benchmark trait	Value
Pregnancy %	93.5	Average daily gain[a]	2.47
Pregnancy loss %	0.6	Weight per day age[a]	2.91
Calving %	92.9	Birth weight[a]	83
Calf death loss %	3.4	Adjusted 205-day weight[a]	620
Weaning %	90.4	Frame score	5.4
Replacement %	15.2	% heifers early	37
Calf death loss % (number born)	3.7	% heifers at 21 days	72
Age at weaning (days)	192	% heifers at 42 days	86
% calves at 21 days	62.1	% cows at 21 days	59
% calves at 42 days	87.2	% cows at 42 days	86
% calves at 63 days	95.8	Cow age (yrs)	5.6
% calves after 63 days	4.2	Cow weight[a]	1411
Steers weaning weight[a]	567	Cow condition	5.8
Heifers weaning weight[a]	537	% culled	13.2
Bulls weaning weight[a]	595		
All weaning weight[a]	554		

Pounds weaned/cow exposed[a]	495		

Note. Updated 11/03/2015. Source: CHAPS website (https://www.ag.ndsu.edu/DickinsonREC/chaps-software-1).
[a]Weights and weight gains are expressed in pounds.

A large historical data set of yearly herd averages from the CHAPS program has been created. A better understanding of historical data will lead to improvement of the CHAPS program, which is currently being updated to better serve producers and Extension. Data management and analysis software is commonly used in beef production and management (Raper, De Vuyst, & Doye, 2010; Williams & Raper, 2011). The results of further analyses of historical CHAPS data may be useful for Extension management and teaching efforts.

In this article, we explain CHAPS benchmark traits and describe the process for selecting CHAPS data for a 20-year data set (CHAPS20Y). We hope to publish subsequent *Journal of Extension* articles to present yearly herd averages from the CHAPS20Y data and to discuss 20-year trends.

CHAPS Benchmark Traits

Calving Distribution

Calving distribution is defined as the percentage of individuals calving during specific periods. The start of the calving season, known as the trigger date (Day 0), is defined as the date that the third mature cow (cow age > 2 years) calves (Ringwall, 2015).

CHAPS calculates the calving distributions of all cows and heifers as well as separate distributions for heifers (cow age = 2 years) and cows (cow age > 2 years). For all groups, 21-day and 42-day intervals are calculated. For cows and heifers combined, 63-day and after-63-day (late) intervals also are calculated. For heifers, early calving percentages (i.e., calving occurring prior to Day 0) also are calculated.

Reproductive Percentages

Pregnancy percentage is the number of confirmed pregnant females relative to the total number exposed to at least one bull within a specified time period (usually 30–60 days after breeding commences). Pregnancy loss percentage is the number of pregnant females that fail to calve relative to the total number of pregnant females. Calving percentage is the number of calves born relative to the number of females exposed to at least one bull. Calf death losses prior to weaning are typically divided into two categories: (a) the number of calf deaths relative to the number of exposed females and (b) the number of calf deaths relative to the number of live calves born. Weaning percentage is the number of calves weaned relative to the number of exposed females. Replacement percentage is the number of raised replacement heifers plus purchased replacement heifers and breeding cows relative to the number of exposed females. Culling percentage is the number of females culled within a 365-day period (bull turnout date to bull turnout date) relative to the number of exposed females.

Weight and Growth

Growth is defined as an increase in size over time. The CHAPS weight and growth benchmarks include birth and weaning weights, including separate weaning weights for bulls, steers, and heifers. Pounds weaned per cow exposed is the number of pounds of calf weaned relative to the number of exposed females. Age at weaning is used to calculate average daily gain, or weight gain from birth to weaning, and weight per day age, or weight divided by age. Adjusted 205-day weight accounts for differences relative to calf ages, cow ages, and sex of calf. Frame score, cow age, cow weight, and cow condition score also are included as growth characteristics.

Creation of the CHAPS20Y Data Set

After examining the historical data set from 764 unique herds with yearly herd means since 1985, the CHAPS team created CHAPS20Y, a 20-year data set of yearly herd means. Data for all benchmark traits were consistently available for the 20-year period 1994–2013, whereas the issue of missing data was common prior to 1994. Criteria for accepting herds into CHAPS20Y included the following conditions:

- at least 50 cows exposed to at least one bull,
- a minimum of 5 consecutive years of data in the historical data set,
- data present in the data set within the past 10 years (e.g., for 2015, data present since 2005), and
- each benchmark trait's having 10 or more records for calculating a herd average.

Characteristics of CHAPS20Y

The CHAPS20Y data set includes 83 herds: 32 herds with 5–10 years of data and 51 with 11–20 years of data. The number of herds per year ranges from 33 to 70, with 5,941 to 17,122 cows per year (Table 2). Over 250,000 cow records are used in the 20-year period. Most herds are from North Dakota (61); others are from Iowa (9), South Dakota (5), Minnesota (3), Montana (2), Nebraska (1), Kansas (1), and Massachusetts (1).

Table 2.
Number of Herds and Cows Used Each Year to Calculate Yearly Averages from the CHAPS20Y Data Set

Year	Herds per year	Cows per year
1994	33	5,941
199	39	7,390

5		
1996	43	8,965
1997	49	9,719
1998	51	9,504
1999	54	10,554
2000	56	11,378
2001	59	12,330
2002	59	12,432
2003	64	13,472
2004	65	13,179
2005	70	15,661
2006	65	14,992
2007	68	15,784
2008	66	17,032
2009	62	17,122
2010	58	15,371
2011	56	15,753
2012	49	13,666

2013	40	11,437

Future Analyses

We hope to publish subsequent *Journal of Extension* articles to highlight trends in calving distribution, reproductive percentages, and growth benchmarks. CHAPS20Y will be useful to Extension as a management and teaching tool and will aid in updating this useful beef management software.

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