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Boggs, Donald L., "Evaluating Cow Herd Productivity with CHAPS" (1990). *Extension Extra*. Paper 43.
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Evaluating Cow Herd Productivity with CHAPS

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CHAPS (Cow Herd Appraisal Performance Software) provides valuable performance information to use in: 1) selecting replacements, 2) making culling decisions, 3) evaluating bull performance, 4) evaluating reproductive efficiency, and 5) trouble-shooting the herd for management and reproductive problems.

CHAPS does a lot more than the typical performance evaluation function of adjusting weaning and yearling weights and calculating ratios. In addition, the program prints: 1) a lifetime history of each cow's performance, 2) a sire summary, 3) a Most Probable Producing Ability (MPPA) genetic evaluation for each cow, 4) a herd reproductive analysis, 5) a calving distribution chart, 6) a summary of weaning weight performance by crossbred cow type, and 7) a history of when and why cows were culled from the herd.

Data Input

A minimal amount of information is mandatory to make the CHAPS program work. The required data include:

- 1) Calf identification
- 2) Cow identification
- 3) Cow age (or best estimate)
- 4) Birth date of calf
- 5) Sex of calf
- 6) Actual weaning weight
- 7) Date weighed

If more detailed inputs are provided, the program will give more thorough and specific summary reports.

Optional data include:

- 1) Birth weight (70 lb is used if actual birth weight is unknown)
- 2) Calving ease
- 3) Cow breed
- 4) Sire of cow
- 5) Sire identification

- 6) Sire breed
- 7) Frame score/Hip height
- 8) Contemporary group
- 9) Calf grade
- 10) Miscellaneous/Comments

CHAPS utilizes your input data to generate two primary reports: 1) the calf report and 2) the cow report. A herd summary of production and reproductive performance is included at the end of the calf report.

Calf Reports

A sample calf report is shown in Table 1. Many of the items listed are self-explanatory; however, a few need mention. CE is the abbreviation for calving ease with 1 = no assistance, 2 = easy pull, 3 = hard pull, etc. Adj 205 Wt is the weaning weight adjusted to 205 days of age and to a mature cow basis. CHAPS uses the BIF (Beef Improvement Federation) age of dam adjustments which are:

Cow Age	Males	Females
2 years	60	54
3 years	40	36
4 years	20	18
5 to 10 years	0	0
11 years and over	20	18

Adj 205 Rat is the adjusted weaning weight ratio. All calves within a sex group that are raised together are compared in this manner. An average calf would have a 100 ratio. A calf that was 10% heavier than average would have a ratio of 110, while a calf that is 10% lighter than average would have a ratio of 90. MGT is an optional management code for items such as creep, no creep, twin, foster calf, etc. Frame score is a value calculated from the actual hip height given as optional data. This measurement gives an indication of potential slaughter weight. For replacement heifers, frame score

Table 1. Sample Calf Report

Calf ID	Birth Date	Bth Wgt	C E	Act Wean Wt	Age In Days	Adj 205 Wt	Adj 205 Rat	M G	Frame Score	Avg Daily Gain	Wt/Day Age	Cont Grp	Misc Code 1	Cow ID	Cow Brd	Age of Cow	Sire ID	Sire Brd
X003	03/19	89	1	625	231	585	99	2	6.1	2.3	2.7	1		S0120	SMHH	11	CH02	CH
C007	05/01	92	2	550	188	612	101	2	5.2	2.4	2.9	1		J0010	HH	11	CH02	CH

gives an indication of mature cow size. **Cont Grp** is the abbreviation for contemporary group, a group of cattle that have been raised under the same management and environmental conditions. When this option is used, a calf report is generated for each management or contemporary group. It is important to use this option if the cow herd is split into more than one group.

Calves are grouped according to calf sex. Averages are reported for the bull, heifer, and steer groups. Individual sire averages for these traits are reported to document the performance of calves from each bull. Cow breed averages are reported for these traits to show how each breed performs within the resources and environment of that specific herd.

Adjusted 205-day weights and ratios provide a better estimate of true genetic differences in preweaning growth rate of the calves and milking ability of the cows than do actual weaning weights. Sire comparisons generally are more accurate and effective when adjusted weights and ratios are used. Remember, however, that young calves with light, actual weaning weights can still have excellent adjusted 205-day weights and ratios. Although these calves may have excellent growth potential or their dams may have excellent milk production potential, these potentials are not translating into additional pounds of beef produced because of the late calving dates. It is possible that these heavy milking cows have exceeded the nutritional capacity of the base forage resources and are not well adapted to their environment. Selecting replacement heifers out of these cows could compound the herd's reproductive problems.

Research also has shown that heifers with the heaviest actual weaning weight (regardless of whether it is due to age or growth rate) are more likely to cycle early and

calve early as two-year-olds and, therefore, produce more total pounds of calf during their lifetimes. Actual weaning weights may do a better job identifying the heifers and cows that will be the most productive within the environment of a particular herd. At the least, look carefully at heifers with low actual weights and high adjusted weights and ratios before adding them to the herd.

A sire summary is included at the end of the calf report. Each sire's calves are summarized for calving and growth performance. In this report, the growth data are adjusted to a steer-calf basis to eliminate any bias due to a disproportionate number of heifer or bull calves.

Cow Reports

Two types of cow reports are offered in CHAPS. The first is a short report that lists the cow's age, breed, MPPA (Most Probable Producing Ability) and sire as well as the number of calves born and weaned and her average calving interval. Table 2 is a longer report that provides this information plus a detailed history of each calf the cow has raised. This report shows each calf's ID, sex, birth date, performance data, and sire. There is also a management code column. In the example, this column has a "C" for the X009 calf which indicates he died at calving.

The MPPA provides an estimate of the probable weaning performance of the cow's next calf. MPPA lets a breeder compare more accurately the potential productivity of cows of different ages that have produced differing numbers of calves. The MPPA is calculated from the adjusted 205-day ratio and thus it predicts differences in adjusted weaning weights and not actual weaning weights. Poor adaptation to the resources and environment will not necessarily be

Table 2. Sample Cow Report

Cow ID	Age of Cow	Cow Brd	MPPA	Num Cav Brn	Num Cav Wnd	Sire Cav Int	S of Calf ID	S E X	Birth Date	Act Brt Wt	Adj Wn Wt	Adj 205 Wt	M 205 Rat	G T	Fram Scor	Av Daily Gain	Wt/Day Age	Misc Code 1	Sire GRD	Sire ID
S0020	4	SMHH	105.6*	3	2	391	U003	3	03/16/86	95	505	532	117		0.0	1.84	2.26			AN01
							W009	3	05/01/87	90	425	503	102		0.0	1.82	2.31			AN01
							X009	3	05/05/88	105	XXX	XXX	0	C	0.0	XXXX	XXXX			CH01
							Ave:			97	465	518	110		0.0	1.83	2.29	0.00		

shown by the MPPA. Therefore, monitoring of actual weaning weights and the calving interval also will be needed to accurately identify the cows working best within the herd's resources and environment.

Herd Summary

The herd summary is included as the last part of the calf report. A sample herd summary report is shown in Table 3. **The first section is an analysis of the reproductive performance of the cows presently in the herd.** This report quantifies the total cows in the herd, the number of cows that were open or aborted, and the number of cows that lost calves prior to weaning. Calving percentages and weaning percentage are then calculated from these numbers.

Cows that have been culled are not included in this section of the herd summary. To get the best evaluation of reproductive performance, the "number of cows sold because of poor fertility or open" (taken from the cow culling summary at the end of the report) needs to be added to the "cows kept for calving" and the "cows open" lines of the reproductive analysis. In the example herd, the 100% calving and weaning percentages change to 96% when the 10 open cull cows are added.

Calving distribution is the second section of the herd summary. This report gives the distribution of calves by 21-day calving periods and the average calving date for each age group of cows. The first 21-day period starts when the second 3-year-old or older cow calves. Any cow or heifer that calves prior to that time is considered in the "early" category.

The average actual weaning weights are reported for each 21-day calving period and serve as a gauge of the productivity lost due to a long calving season.

A summary of actual weaning weights for calves born in the various 21-day calving periods from 83 Iowa beef herds is shown in Table 4. Actual weaning weights became progressively lighter by approximately 25 to 35 lb for each 21 days later that calves were born. When the herds were grouped into high and low groups according to reproductive performance (calving distribution), there was a 29.0-lb difference in the actual weaning weights between the high and low groups.

When the weights were compared by calving period, there was virtually no difference between the high and low groups, with a slight advantage to calves in the low reproductive group. This would substantiate that the overall performance advantage of the high reproductive group was because a higher percentage of the calves were born early in the calving season, not because of additional growth potential.

Table 4. Average Actual Weaning Weights of Calves Born in the Various 21-day Periods of the Calving Season From the 83 CHAPS Herds

Calving period	Average for 83 herds	High 1/3 28 herds	Low 1/3 28 herds
Early	553.7	555.6	587.7
1st 21 days	557.5	549.2	541.9
2nd 21 days	520.7	506.6	512.9
3rd 21 days	495.1	451.1	487.2
4th 21 days	458.6	422.6	457.5
Late	389.2	376.5	379.1
Overall average	522.3	527.3	498.3

Iowa State University, 1988.

Production is summarized in the third section. The total and average actual pounds of beef produced are reported along with a herd uniformity score. This score is an indicator of the variation in the herd. Two-thirds of the calves in the herd will have actual weights that are plus or minus the uniformity score from the herd average. Ninety-five percent of the calves are plus or minus twice the uniformity score from the herd average.

In the example herd summary, the average actual weight was 550 lb and the herd uniformity score was 56.0 lb. Therefore, two-thirds of the calves weighed between 494 and 606 lb (550 ± 56.0) and 95% of the calves weighed between 438 and 662 lb [$550 \pm (2 \times 56.0)$]. The production summary also includes averages for age at weaning, weight per day of age to weaning, and birth weight as well as a record of the number of bulls, heifers, and steers that were born and weaned.

The cull cow report, cows leaving the herd since last year's weaning, is the last section of the herd summary. It reports the number of cows that have left the herd because of 1) death, 2) old age, 3) physical defects, 4) poor fertility or open, 5) inferior calves or poor performance, and 6) replacement stock sales.

When running the CHAPS program, use weaning date to weaning date as the desired reporting period. This will ensure the inclusion of all cull cows in the cull cow summary.

Preliminary Calf Report

A new feature of the latest version of CHAPS is a preliminary calf report. It will provide sire averages within calf sex for birth weight and calving ease. Use this report to identify both calving ease and hard calving bulls prior to the start of the breeding season. This preliminary report also gives calving distribution.

Table 3. Sample Herd Summary From CHAPS Calf Report

HERD SUMMARY

SUMMARY OF COWS PRESENTLY WITHIN THE HERD

TOTAL COWS KEPT FOR CALVING	250
# COWS ABORTED	0
# COWS OPEN	0
PERCENT OF COWS CALVING	100.0
# COWS LOSING CALF	0
PERCENT OF COWS WEANING CALVES	100.0

CALVING DISTRIBUTION REPORT

DAM AGE	# CALVES EACH AGE	# CALVES BORN DURING EACH PERIOD					OPEN/AB LATE COWS	AVG DATE EACH AGE	AVG ACT WN WT
		EARLY	1ST 21	2ND 21	3RD 21	4TH 21			
2	44	22	11	8	3	0	0	03/21/89	522
3	1	0	0	1	0	0	0	04/13/89	540
4	56	0	20	29	7	0	0	04/08/89	556
5	8	0	4	3	1	0	0	04/07/89	515
6	20	0	3	15	2	0	0	04/10/89	570
7	27	0	6	18	3	0	0	04/09/89	552
8	38	0	12	24	2	0	0	04/07/89	581
9	23	1	8	10	4	0	0	04/09/89	547
10	16	0	6	7	3	0	0	04/08/89	538
11	16	0	2	11	3	0	0	04/13/89	536
12+	1	0	0	1	0	0	0	04/06/89	587
TOTAL	250	23	72	127	28	0	0	04/05/89	550

AVERAGE ACTUAL WEAN WEIGHT	571.7	563.0	551.7	502.1	0.0	0.0
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ACTUAL POUNDS OF BEEF PRODUCED AT WEANING: TOTAL 137815 AVERAGE 550

HERD UNIFORMITY SCORE OF CALVES WEANED 56.0

# OF CALVES BORN	BULLS	0	HEIFERS	112	STEERS	138
# OF CALVES WEANED	BULLS	0	HEIFERS	112	STEERS	138

# OF CALVES LOST PREWEANING	0
AVERAGE DAYS OF AGE OF CALVES AT WEANING	234.1
WEIGHT PER DAY OF AGE TO WEANING	2.4
AVERAGE BIRTH WEIGHT	0.0
AVERAGE SEX ADJUSTED 205 DAY WEIGHT	490.3

SUMMARY OF COWS LEAVING THE HERD SINCE LAST YEARS WEANING:

# COWS DIED	0
# COWS SOLD BECAUSE OF AGE	8
# COWS SOLD BECAUSE OF PHYSICAL DEFECTS	4
# COWS SOLD BECAUSE OF POOR FERTILITY OR OPEN	10
# COWS SOLD BECAUSE OF INFERIOR CALVES	18
# COWS SOLD FOR REPLACEMENT STOCK	0

Trouble-shooting With CHAPS

The CHAPS herd summary is an excellent tool for trouble-shooting management problems in a herd.

The reproductive performance summary does a good job of analyzing fertility and reproduction. If the number of cows that aborted exceeds 2% of the total, consult a veterinarian and investigate the possibility of reproductive diseases. A large number of open cows would indicate infertility, disease, poor nutrition, improper reporting of pregnancy, or a management decision to carry-over open cows.

Pregnancy testing is a highly recommended management technique for reducing production costs and increasing efficiency and profitability. If more than 5% of the cows that are at least 4 years old or more than 10% of the younger cows are detected open, a serious fertility problem could exist. Take a close look at bull fertility evaluation and the cow nutrition and vaccination programs.

A high number of calf deaths could indicate weak calves, a high incidence of calving difficulty, or a health problem in the herd. If weak calves are a problem, evaluate the precalving cow nutrition program, the herd's vaccination program, and calving-time management procedures. If the incidence of calving difficulty is high, give immediate attention to the sire selection program to identify calving-ease sires. Also consider adding pelvic measurements to the replacement heifer selection procedures. If health problems are identified, contact a veterinarian to develop a preventive health program to minimize health problems in next year's calf crop.

The calving distribution report is another excellent indicator of reproductive performance. The calving distribution in the sample herd summary (Table 3) is an example of excellent reproductive efficiency. One-half of the first-calf heifers calved ahead of the cow herd and only 3 out of 44 calved in the last 21 days of the calving season. These are key points in establishing and maintaining a controlled breeding season.

In this herd, 89% of all the calves were born prior to the 43rd day of the calving season. This ensures that these cows will be at least 40 days postcalving prior to the start of the next breeding season and it should greatly enhance next year's calving distribution.

Consider also the relatively high number of older cows. This indicates a potential need for increased culling because of age which could affect future replacement heifer needs.

In contrast, the calving distribution report in Table 5 exemplifies a long, strung-out calving season. With calving this spread out, it will be difficult to properly feed and manage the cow herd according to their stage of production. With 35% of the cows calving relatively late, it will be difficult to get the cows rebred in a timely manner.

While the calving distribution on the 2-year-olds is acceptable, with only a few late calves, the main problems appear to be with the 3-, 4-, and 5-year-olds. This could be pointing to a recurring problem with the nutritional management of the 2-year-olds, resulting in difficulty getting them rebred.

Table 5. Sample Calving Distribution Report. Long Calving Season

Dam age	# Calves each age	# Calves born during each period						Open/ab cows	Average date for each age
		Early	1st 21	2nd 21	3rd 21	4th 21	Late		
2	31	0	13	8	2	5	3	0	3/17/89
3	40	1	1	10	13	5	10	0	4/09/89
4	24	0	1	4	12	2	5	0	4/09/89
5	22	0	1	3	7	4	7	0	4/19/89
6	19	0	0	1	12	2	4	0	4/14/89
7	20	0	0	4	8	3	5	0	4/14/89
8	14	0	0	0	8	1	5	0	4/25/89
9	6	0	0	0	3	2	1	0	4/14/89
10	11	0	0	3	5	2	1	0	4/02/89
11	1	0	0	0	1	0	0	0	3/27/89
12+	1	0	0	0	1	0	0	0	4/04/89
Total	189	1	16	33	72	26	41	0	4/08/89
Average actual wean weight		842.0	700.6	668.1	642.6	560.8	473.6		

Even though calf performance of this herd appears to be excellent, the herd uniformity is not. The herd uniformity score was 96.8 (not shown) which means a weight range in the calves of more than 400 lb.

Another sample calving distribution report is shown in Table 6. In this herd, heifers are not calved ahead of the herd. Still, 81% of the calves arrived within the first 42 days of the calving season which indicates a good postcalving nutrition program. However, the wide calving distribution of the 2-year-olds indicates management of the yearling heifers may be suspect. It will be difficult to get these late-calving 2-year-olds rebred.

Calf performance as reported in the **production summary** is affected by the cow's milking ability, calf health, genetic growth potential, and forage conditions. Comparative analysis of calf performance with that from herds with similar resources can provide insight into how much performance might be increased through sire selection versus improved nutrition and management.

The cull cow report also provides valuable information. A year-to-year evaluation of the reasons cows are leaving the herd can point out recurring management problems. Cow death loss is obviously a serious category and may represent calving difficulty, retaining old cows in the herd for too long, or major herd health problems related to nutrition and diseases. Consult your veterinarian if cow death loss is a recurring problem.

The number of cows sold because of poor fertility or being open should be minimal. This is a lowly heritable trait and most of the variation is caused by environment. If open cows are a recurring problem, you can be almost certain there is a problem in either nutrition, management, or herd health.

In contrast, higher percentages of cows culled because of age, physical defects, or inferior calves are a sign of sound and effective nutrition and management programs. These all are good reasons to cull cows. Replacing cows for these reasons should result in more genetic progress.

CHAPS and IRM

IRM (Integrated Resource Management) is a concept which bases production and marketing decisions on optimum utilization of all resources.

CHAPS is an important part of the South Dakota IRM program. When CHAPS is combined with the financial analysis program FINPACK, key performance indicators can be analyzed and the factors which are limiting the success of the operation can be identified.

If your herd is not enrolled in CHAPS and FINPACK, contact your county Extension office. Through these analyses, you can take action to ensure maximum profitability and competitiveness through the optimum utilization of all resources.

Table 6. Sample Calving Distribution Report. Heifers Calved With Main Cow Herd

Dam age	# Calves each age	# Calves born during each period						Open/ab cows	Average date for each age
		Early	1st 21	2nd 21	3rd 21	4th 21	Late		
2	44	0	16	16	8	2	2	0	4/27/89
3	39	1	24	10	3	0	1	0	4/14/89
4	0	0	0	0	0	0	0	0	
5	34	0	14	10	4	5	1	0	4/25/89
6	0	0	0	0	0	0	0	0	
7	0	0	0	0	0	0	0	0	
8	58	0	28	24	4	1	1	0	4/18/89
9	0	0	0	0	0	0	0	0	
10	29	0	16	7	3	1	2	0	4/22/89
11	0	0	0	0	0	0	0	0	
12+	0	0	0	0	0	0	0	0	
Total	204	1	98	67	22	9	7	0	4/21/89
Average actual wean weight		670.0	598.8	570.2	535.5	473.3	390.0		