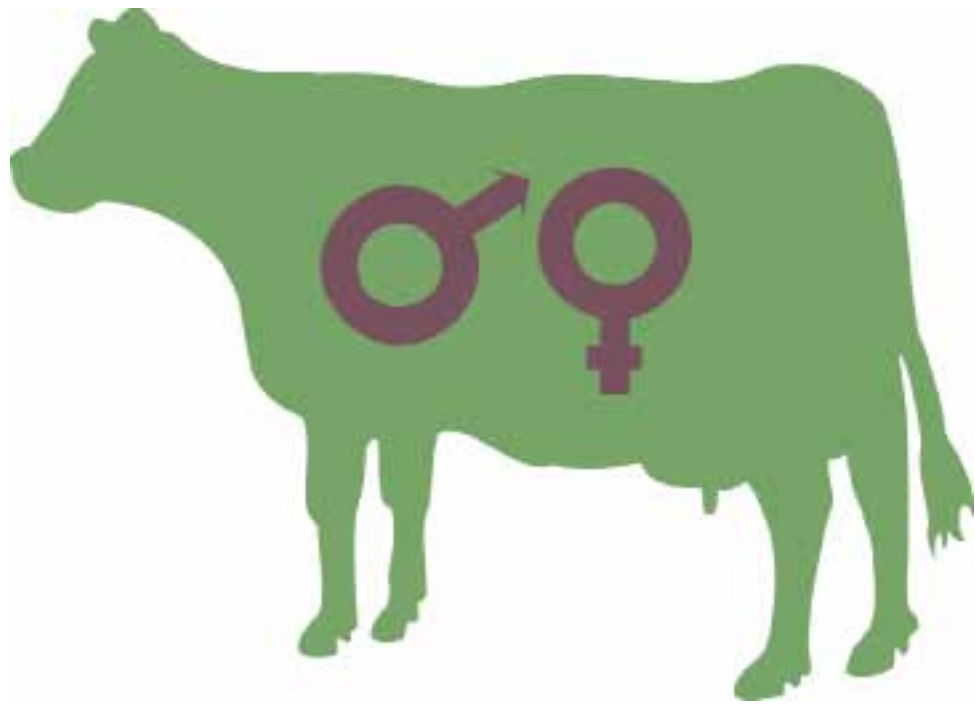




Dairy Reproduction Benchmarks



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An abundance of information and numerous resources are available through the Dairy Records Management Systems (DRMS), Raleigh, North Carolina, for use in herd management analysis. The DHI-202 Herd Summary Report is a valuable source of information. Herd summary data can uncover many herd management strengths and weaknesses.

The purpose of this bulletin is to provide reproduction benchmarks for Holstein herds processed by DRMS. Some examples of using and applying benchmark values are provided. This bulletin, however, should be viewed primarily as a comprehensive resource for reproduction benchmark values. These benchmarks will be useful to dairy producers, dairy managers, consultants, veterinarians and agri-business representatives as a first step in the analysis of herd management practices.

Methods

Herd Summary information was obtained from the DRMS, Raleigh, North Carolina, for Holstein herds last tested in November or December, 2000. Research has shown that management variables may differ by region of the country, herd size and milk production level. Consequently, benchmark values are presented for Northeast, Midsouth, Midwest and South regions (Figure 1). Within regions, values are further subdivided by either herd size or rolling herd average milk production. Values in all tables and graphs were limited to herds with a minimum of 25 cows. Minimum rolling herd milk production for herds included in percentile tables was 12,000 pounds. Note that all analyses and calculations are based on herd average information and not on individual cow data.



Figure 1. Map of United States showing four regions.

Herds using natural service sires seldom report the number of services. The result is a distortion of many DHI reproductive parameters such as services per pregnancy. Values in this bulletin are listed for herds using predominately artificial insemination (AI) as well as for all herds regardless of sire usage. AI herds are defined as those with 70 percent or more AI services with minimum services per pregnancy equal to 1.5 for both pregnant and all cows. Herds in the “all” category were not restricted by any reproductive parameter.

Statistics calculated for certain benchmark values were n, mean, standard deviation and percentile ranks. Following are definitions of these terms:

N - The number of observations (herds) included in a specific analysis.

Mean - The average calculated as the sum of all observations divided by N.

Standard Deviation (SD) - A measure of the variability of the observations. The larger the SD, the more variation among the observations.

Percentile Rank - Percentiles are defined as a value such that X% falls short of the value and Y% exceeds the value. For example, if a benchmark value is at the 75th percentile, then 75 percent of the herds analyzed had values below the benchmark and 25 percent had values above the benchmark. A herd value at the 75th percentile rank is in the top 25 percent of all herds analyzed.

Measures of Reproductive Efficiency

Average days open is an overall indicator of reproductive efficiency status. Projected average days open as listed in this bulletin includes cows with breeding dates and cows without breeding dates in milk longer than the Voluntary Waiting Period (VWP). The VWP 4 is the desired minimum number of days from calving

until first service and is selected by the producer. Calving interval is the period of time between calvings and is measured in months. The projected minimum calving interval equals Average Days Open + 280 days/30.4, where 280 days is the average length of gestation and 30.4 days is the average length of a month. The effect of calving interval on net operating income (income - expenses) to owner's labor and management for a 200-cow dairy is shown in Table 1.

Table 1. Effect of Calving Interval on the Net Operating Income (Income - Expenses) of a 200-Cow Dairy Herd at Different Target Levels of Milk Production.

Target Herd Avg. (lbs)	CI (mo)	Actual Herd Avg. (lbs)	No. Milk Cows	Net Cash Income (\$)
16,000	13	17,538	184	66,815
	14	16,286	171	49,083
	15	15,200	160	33,725
18,000	13	19,385	184	112,608
	14	18,000	171	91,240
	15	16,800	160	72,731
20,000	13	21,600	184	174,433
	14	20,057	171	148,649
	15	18,720	160	126,312
22,000	13	23,723	184	217,327
	14	22,029	171	188,477
	15	20,560	160	163,483

The University of Georgia cash flow dairy budget program was used to generate these comparisons. The herd size was held constant at 200 cows. The number of cows milking and dry is a function of the calving interval. Other assumptions included a 60-day dry period and no replacement rearing expenses. Rations were balanced for each target level of production causing increased feed cost for each higher level of target milk production. The dry cow ration remained constant for each level of production. All other costs were held constant. For each target level of milk production, budgets were run for a calving interval of 13, 14 or 15 months. With increasing calving intervals, the number of lactating cows and net operating income declines for each level of target milk production. Although feed costs are lower at longer calving intervals since more cows are eating the less expensive dry cow ration instead of the milk cow ration, the loss of milk income is greater. As level of target milk production increases, net operating income tends to increase as well.

The potential loss in net operating income for changing calving interval is reported in Table 2. The cost of a longer calving interval is greater with higher levels of production. The cost per cow per added day open is reported in Table 3. This cost changes with level of production and is different for the added days open associated with different calving intervals. This estimate varies between \$2.52 to \$4.74 per cow per added day open at the different levels of production when changing from a 13- to 14-month calving interval or from a 14- to 15-month calving interval.

Table 2. Loss in Net Operating Income (Income - Expenses) with Increasing Calving Interval at Different Levels of Target Milk Production.

Target Herd Avg. (lbs)	Calving Interval (mos.)		
	13 vs. 14	14 vs. 15	13 vs. 15
16,000	\$17,732	\$15,358	\$33,090
18,000	\$21,368	\$18,509	\$39,887
20,000	\$25,784	\$22,337	\$48,121
22,000	\$28,850	\$24,994	\$53,844

Many factors affect the actual cost of days open on a particular farm. These factors include milk price, cow numbers, production level, AI and veterinary expenses, bST use, potential replacement losses and replacement rearing expenses. With higher production levels, there is potentially greater income loss as days open and calving interval increase. The use of bST has complicated the evaluation of optimal calving intervals since cows may continue to produce at profitable levels for a much longer period. But if these conditions can be met, higher potential returns will be available with the shorter calving interval. Moreover, many herds are not using bST or are using bST on only a few cows. The high cost of added days open should provide incentive to examine the reproductive efficiency of your herd. Many management tools are now available that can help shorten calving intervals.

Table 3. Estimated Cost per Cow per Added Day Open of Higher Calving Intervals at Different Levels of Target Milk Production.

Target Herd Avg. (lbs)	Calving Interval (mos.)		
	13 vs. 14	14 vs. 15	13 vs. 15
16,000	\$2.92	\$2.52	\$2.76
18,000	\$3.51	\$3.04	\$3.32
20,000	\$4.24	\$3.67	\$4.10
22,000	\$4.74	\$4.11	\$4.49

Days to first service (DFS), conception rate (CR) and heat detection rate (HDR) all combine to influence days open and calving interval. Average days to first service is affected by the selected voluntary waiting period, heat detection efficiency and herd reproductive health.

Generally, dairy producers set a VWP of 45 to 60 days, which enables the minimum days to first service. The days to first service further sets the minimum calving interval for a cow and the herd. The average time between calvings will be longer than the minimum calving interval because not all cows will conceive on first service and some cows experience early embryonic death. The conception rate, heat detection efficiency and postpartum breeding policy strongly influence the calving interval.

Accurate heat detection is especially important for herds breeding by AI; however, it is also important for natural service herds. It provides the basis upon which most reproduction management decisions are made. Detection of the first estrous period following calving provides a reference point upon which to expect subsequent estrous periods. It is also beneficial in determining whether a cow is recovering normally from calving.

Heat detection is a major factor affecting days open and calving interval. The percent of heats observed is an indicator of the overall success of a heat detection program. Not only must estrous be observed, but the observation and breeding must be done on a timely basis for conception to occur.

Measures of conception rate include services per pregnancy and percent successful services. Services per pregnancy are available for pregnant cows and all cows. The percent successful services is equal to the number of successful services divided by the number of total services. For herds on routine pregnancy diagnosis, reported pregnancies are used to calculate the percent successful. When actual pregnancy data are not reported, the 65-day non-return rate is used.

Several measures of reproductive efficiency for AI herds by region are presented in Tables 4-7. The data are further divided into five or six groupings based on herd size to better reflect management differences. These tables provide a convenient means of comparing a herd's reproductive efficiency to similar herds in the same region.

Tables 8-11 present a limited selection of measures of reproductive efficiency for all herds sorted by region and herd size. Because data generated by natural service herds are limited, only the information regarding days open

and days dry are valid. Evaluation is difficult in these situations. These data, however, can identify those herds that have significant reproductive problems.

Example 1

Jim is a dairy producer in Iowa. His herd consists of 175 cows. The days to first service is 105 and days open is 185. The percentage of heats observed is 45 percent. He is currently averaging 2.3 services per conception with his pregnant cows and a 38 percent success rate. He would like to compare his herd with similar herds in his region.

Jim uses Table 6 for the Midwest region and looks at the specific table for his size herd. He finds that his 105 days to first service rank him in the bottom 25 percent of similar herds. His 185 days open places him in the bottom 10 percent. He compares the percentage of heats observed and finds that he is in the top 50 percent of comparable herds. Jim further observes that his services per conception ranks him in the top 50 percent and his percent successful rate is slightly below the 50th percentile. These data lead Jim to conclude that his semen handling and insemination techniques are acceptable; however, heat detection and care of the postpartum cow are of primary concern.

Dry Period

Both long and short dry periods affect profitability. A high percentage of cows in the 40-70 day dry period length is recommended. A short dry period does not provide enough rest and time for mammary gland involution and regeneration. Long dry periods extend the time period when no milk income is available and increase the possibility of overconditioned cows. Overconditioned cows are more prone to health and reproductive problems. Long and short dry periods may be a consequence of extended or long calving intervals, inadequate cow identification, poor record-keeping or poor pregnancy diagnosis. Days dry for AI herds are summarized in Tables 4-7. Percentile rankings are given for average days dry as well as the percentage of cows dry between 40 and 70 days.

Example 2

John has a herd of 45 cows in Connecticut with an average days dry of 65 and with 75 percent of the dry periods between 40 and 70 days. His herd ranks in the top 50th percentile for percent dry 40-70 days and a little below the 50th percentile for average days dry of all herds in the region (see Table 4). This indicates that he is doing above average in percent dry 40-70 days and average in average days dry.

Herd Reproduction Program

A comparison of herd values with the values in Tables 4-12 provides the opportunity to evaluate reproductive performance based on herd size, region and milk production level. Producers can fine tune their evaluation to pinpoint specific areas that may need improvement. Following are two examples showing how this information may be used in an evaluation of herd reproductive performance.

Example 3

George has a herd of 165 cows in Kentucky. He breeds a few of his best cows by AI but breeds the majority to his three herd bulls. His days open is 150 days, days dry is 70 and percentage of cows with dry periods between 40 and 70 days is 55 percent. Because George breeds primarily by natural service, he is not able to make many in-depth comparisons. He selects Table 9 and finds that his days open place him in the top 50 percent of similar

herds. The average days dry for his herd places him between the 25th and 50th percentiles. The percent of dry periods between 40 and 70 days for his herd places him between the 10th and 25th percentiles. These are areas where he can make improvement, but determining the underlying causes will be difficult because of limited information.

Example 4

Bill has a herd in Georgia with a herd average of 19,585 pounds. He checks Table 12 for the South region and finds that similar herds with a 19,000 pound rolling herd average have an average days to first service of 94 and average days open of 173. He further notices that the average services per pregnancy are 2.5 and 4.5 for pregnant cows and all cows, respectively. Days dry average 69 days and the percentage of cows dry 40 to 70 days average 66 percent for similar herds in his region. Any values for his herd that fall outside these ranges indicate strengths or weaknesses in his management.

Recommendations

After an evaluation is complete, establish goals to improve performance. Goals for improvement of parameters such as days open must also consider the interrelationship with other reproductive parameters. For example, a goal of 115 days open and a 60-day dry period requires that, on average, conception must be at 115 days. If 2.0 services per pregnancy are maintained, then days to first service must average 73 days with a VWP of 60 days. Heat detection must also be excellent.

Summary

Benchmarks provide a convenient method of comparing the performance of your herd with the performance of similar herds. The information provided in this bulletin allows producers or advisors to evaluate a herd's performance with similar herds and determine potential strengths and weaknesses in management. Specific recommendations cannot be made based on this information. Producers are encouraged to consult experts who can help identify specific problems and recommend solutions.

Table 4. Measures of Reproductive Efficiency for AI Herds in the Northeast Region by Herd Size.

Up to 50 cows								
				Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th
Days to 1st Service	583	91	17	113	100	89	80	73
Days Open	583	147	26	181	160	145	129	118
Services/Pregnancy (Preg.)	583	2.3	0.4	2.8	2.5	2.2	2.0	1.8
Services/Pregnancy (All)	583	3.0	0.7	3.9	3.4	2.8	2.4	2.1
Average Days Dry	583	66	9.3	76	70	64	60	56
% Dry 40-70 Days	583	68	15	47	58	70	79	86
Heats Observed	582	48	11	32	41	48	55	62
% Successful	583	42	8.7	32	36	42	49	54

50 to 99 cows								
				Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th
Days to 1st Service	1237	93	18	115	102	89	80	74
Days Open	1237	148	26	183	162	144	130	118
Services/Pregnancy (Preg.)	1237	2.2	0.4	2.7	2.4	2.2	2.0	1.8
Services/Pregnancy (All)	1237	3.0	0.7	3.8	3.3	2.9	2.5	2.2
Average Days Dry	1237	64	8.8	75	69	63	58	54
% Dry 40-70 Days	1237	69	15	48	60	70	80	86
Heats Observed	1236	46	11	32	39	46	54	59
% Successful	1237	42	8.0	32	37	42	48	52

100 to 149 cows								
				Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th
Days to 1st Service	379	91	17	112	98	88	80	74
Days Open	379	149	27	184	162	143	129	119
Services/Pregnancy (Preg.)	379	2.2	0.3	2.7	2.4	2.2	2.0	1.8
Services/Pregnancy (All)	379	3.2	0.8	4.0	3.5	3.0	2.6	2.4
Average Days Dry	379	64	9.9	74	67	62	58	53
% Dry 40-70 Days	379	70	14	51	62	71	80	87
Heats Observed	379	46	10	32	39	47	52	58
% Successful	379	40	7.5	31	35	41	45	50

Table 4. Measures of Reproductive Efficiency for AI Herds in the Northeast Region by Herd Size (continued).

150 to 249 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days to 1st Service	249	85	15	103	92	83	76	69	
Days Open	249	143	21	173	154	139	131	120	
Services/Pregnancy (Preg.)	249	2.3	0.3	2.7	2.5	2.3	2.1	1.9	
Services/Pregnancy (All)	249	3.3	0.7	4.2	3.7	3.2	2.8	2.4	
Average Days Dry	249	62	8.3	72	66	62	57	53	
% Dry 40-70 Days	249	74	13	57	67	76	83	88	
Heats Observed	249	48	10	35	42	48	55	61	
% Successful	249	39	7.4	30	34	38	44	48	

250 to 349 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days to 1st Service	103	83	15	97	88	81	74	68	
Days Open	103	144	31	174	154	139	127	121	
Services/Pregnancy (Preg.)	103	2.4	0.4	2.9	2.6	2.3	2.1	2.0	
Services/Pregnancy (All)	103	3.4	0.8	4.5	4.0	3.3	2.8	2.6	
Average Days Dry	103	63	13	70	65	62	58	48	
% Dry 40-70 Days	103	75	12	61	69	76	82	87	
Heats Observed	103	49	10	35	43	49	55	61	
% Successful	103	37	7.4	27	32	37	42	46	

350+ cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days to 1st Service	153	80	12	95	86	78	71	67	
Days Open	153	142	19	164	153	140	129	119	
Services/Pregnancy (Preg.)	153	2.4	0.3	2.8	2.6	2.3	2.2	2.0	
Services/Pregnancy (All)	153	3.5	0.7	4.2	3.9	3.5	3.1	2.1	
Average Days Dry	153	64	6.3	71	367	63	60	56	
% Dry 40-70 Days	153	74	11	59	68	77	81	86	
Heats Observed	153	50	10	37	45	51	58	63	
% Successful	153	34	5.9	27	31	34	38	42	

Table 5. Measures of Reproductive Efficiency for AI Herds in the Midsouth Region by Herd Size.

Up to 50 cows								
				Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th
Days to 1st Service	56	102	21	122	116	102	86	77
Days Open	56	165	33	214	183	156	142	126
Services/Pregnancy (Preg.)	56	2.4	0.3	2.8	2.6	2.3	2.1	1.9
Services/Pregnancy (All)	56	3.4	1.2	4.6	3.9	3.1	2.7	2.3
Average Days Dry	56	70	15	88	78	66	60	53
% Dry 40-70 Days	56	61	18	38	50	62	71	85
Heats Observed	56	42	12	28	34	41	49	59
% Successful	56	43	8.2	32	37	43	49	52

50 to 99 cows								
				Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th
Days to 1st Service	311	97	20	123	108	93	83	76
Days Open	311	159	31	202	175	153	139	125
Services/Pregnancy (Preg.)	311	2.2	0.4	2.7	2.4	2.2	2.0	1.8
Services/Pregnancy (All)	311	3.4	1.1	4.5	3.7	3.1	2.7	2.4
Average Days Dry	311	68	11	80	72	66	61	58
% Dry 40-70 Days	311	69	15	48	60	71	80	87
Heats Observed	311	42	11	29	34	42	49	57
% Successful	311	42	9	31	36	42	48	53

100 to 149 cows								
				Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th
Days to 1st Service	254	94	19	119	105	90	82	73
Days Open	254	162	30	207	178	156	142	127
Services/Pregnancy (Preg.)	254	2.4	0.4	2.9	2.7	2.3	2.1	1.9
Services/Pregnancy (All)	254	3.8	1.2	5.2	4.2	3.6	3.0	2.5
Average Days Dry	254	67	10	80	72	65	60	57
% Dry 40-70 Days	254	70	14	50	61	72	80	85
Heats Observed	254	45	11	30	38	45	52	59
% Successful	254	38	8.9	26	33	37	43	51

Table 5. Measures of Reproductive Efficiency for AI Herds in the Midsouth Region by Herd Size (continued).

150 to 249 cows								
				Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th
Days to 1st Service	162	91	18	118	98	87	79	72
Days Open	162	163	30	207	183	156	139	131
Services/Pregnancy (Preg.)	162	2.4	0.4	3.0	2.7	2.4	2.1	2.0
Services/Pregnancy (All)	162	4.0	1.2	5.6	4.5	3.7	3.1	2.7
Average Days Dry	162	67	12	82	71	65	59	56
% Dry 40-70 Days	162	69	14	48	60	70	80	85
Heats Observed	162	46	11	31	38	47	54	59
% Successful	162	36	9.0	25	30	37	41	46

250+ cows								
				Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th
Days to 1st Service	67	90	18	113	98	86	78	73
Days Open	67	166	26	207	183	164	148	134
Services/Pregnancy (Preg.)	67	2.5	0.4	3.1	2.8	2.4	2.2	2.1
Services/Pregnancy (All)	67	4.1	1.1	5.6	4.8	3.8	3.2	2.7
Average Days Dry	67	67	9	75	72	65	61	58
% Dry 40-70 Days	67	71	15	49	61	73	84	88
Heats Observed	67	44	13	27	37	44	54	60
% Successful	67	34	9.5	23	28	34	39	44

Table 6. Measures of Reproductive Efficiency for AI Herds in the Midwest Region by Herd Size.

Up to 50 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days to 1st Service	232	99	18	121	109	96	87	81	
Days Open	232	160	31	200	176	158	140	123	
Services/Pregnancy (Preg.)	232	2.2	1.4	2.9	2.5	2.2	1.9	1.8	
Services/Pregnancy (All)	232	3.0	0.9	4.3	3.5	2.8	2.4	2.0	
Average Days Dry	232	63	10	76	69	61	57	53	
% Dry 40-70 Days	232	69	17	46	56	70	82	89	
Heats Observed	232	40	11	26	32	39	47	53	
% Successful	232	45	9.6	32	37	45	52	57	

50 to 99 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days to 1st Service	728	98	20	124	108	95	85	76	
Days Open	729	158	31	199	174	154	138	123	
Services/Pregnancy (Preg.)	729	2.2	0.4	2.7	2.4	2.1	1.9	1.8	
Services/Pregnancy (All)	729	3.1	1.0	4.3	3.5	2.9	2.5	2.2	
Average Days Dry	729	64	11	74	68	63	57	53	
% Dry 40-70 Days	727	69	15	49	59	71	80	86	
Heats Observed	726	40	10	27	33	40	47	54	
% Successful	729	44	9.5	32	37	44	50	56	

100 to 149 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days to 1st Service	352	96	21	123	106	92	83	75	
Days Open	352	160	31	202	175	155	138	128	
Services/Pregnancy (Preg.)	352	2.2	0.4	2.8	2.5	2.2	2.0	1.8	
Services/Pregnancy (All)	352	3.3	0.9	4.4	3.8	3.1	2.6	2.3	
Average Days Dry	352	63	9.2	73	66	62	57	53	
% Dry 40-70 Days	352	70	15	49	62	73	82	88	
Heats Observed	352	41	11	26	32	41	49	55	
% Successful	352	41	9	30	34	41	48	53	

Table 6. Measures of Reproductive Efficiency for AI Herds in the Midwest Region by Herd Size (continued).

150 to 249 cows								
				Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th
Days to 1st Service	196	92	17	114	102	89	80	73
Days Open	196	154	23	184	164	150	140	130
Services/Pregnancy (Preg.)	196	2.3	0.4	2.8	2.5	2.3	2.0	1.8
Services/Pregnancy (All)	196	3.4	1.1	4.6	3.7	3.2	2.8	2.5
Average Days Dry	196	63	86	75	67	62	57	54
% Dry 40-70 Days	196	73	14	56	66	76	84	89
Heats Observed	196	43	12	28	35	42	51	59
% Successful	196	39	8.2	30	34	39	45	50

250+ cows								
				Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th
Days to 1st Service	145	86	16	105	95	83	74	68
Days Open	145	156	21	187	167	155	142	131
Services/Pregnancy (Preg.)	145	2.4	0.4	3.0	2.7	2.4	2.2	2.0
Services/Pregnancy (All)	145	3.8	1.2	5.1	4.3	3.7	3.1	2.5
Average Days Dry	145	64	9.7	73	68	63	59	56
% Dry 40-70 Days	145	71	13	56	65	75	81	85
Heats Observed	145	46	12	32	37	45	55	63
% Successful	145	34	9.0	24	29	34	39	46

Table 7. Measures of Reproductive Efficiency for AI Herds in the South Region by Herd Size.

Up to 100 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days to 1st Service	65	100	19	122	111	99	87	78	
Days Open	65	175	33	214	192	174	152	136	
Services/Pregnancy (Preg.)	65	2.4	0.4	3.1	2.7	2.4	2.1	1.8	
Services/Pregnancy (All)	65	4.0	1.1	5.3	4.6	3.8	3.4	2.6	
Average Days Dry	65	71	15	93	78	68	61	57	
% Dry 40-70 Days	64	64	17	41	54	67	77	86	
Heats Observed	65	42	11	31	37	41	48	56	
% Successful	65	40	11	26	33	39	45	55	

100 to 149 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days to 1st Service	67	101	21	125	114	98	85	76	
Days Open	67	179	35	231	205	172	152	136	
Services/Pregnancy (Preg.)	67	2.4	0.4	3.0	2.6	2.4	2.0	1.8	
Services/Pregnancy (All)	67	4.0	1.4	6.5	4.5	3.7	2.9	2.5	
Average Days Dry	67	71	12	86	77	70	63	56	
% Dry 40-70 Days	67	63	14	44	53	64	74	80	
Heats Observed	67	42	13	28	33	42	50	60	
% Successful	67	40	10	27	33	38	48	53	

150 to 249 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days to 1st Service	88	95	17	117	104	93	82	75	
Days Open	88	175	31	204	188	170	152	140	
Services/Pregnancy (Preg.)	88	2.6	0.5	3.2	2.8	2.6	2.2	1.9	
Services/Pregnancy (All)	88	4.4	1.6	6.5	5.1	4.2	3.1	2.6	
Average Days Dry	88	70	11	83	74	67	62	59	
% Dry 40-70 Days	88	64	14	44	54	66	75	79	
Heats Observed	88	44	12	25	36	46	52	57	
% Successful	88	36	11	23	29	34	44	51	

Table 7. Measures of Reproductive Efficiency for AI Herds in the South Region by Herd Size (continued).

250 to 499 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days to 1st Service	65	91	18	116	100	89	78	72	
Days Open	65	174	28	221	190	169	154	141	
Services/Pregnancy (Preg.)	65	2.6	0.4	3.2	2.8	2.5	2.3	2.1	
Services/Pregnancy (All)	65	4.5	1.1	6.4	5.2	4.4	3.7	3.0	
Average Days Dry	65	67	8.9	79	70	65	62	58	
% Dry 40-70 Days	65	69	12	53	59	71	78	83	
Heats Observed	65	46	14	27	35	47	52	64	
% Successful	65	33	7.9	24	28	33	39	44	

500+ cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days to 1st Service	59	79	18	107	87	77	67	61	
Days Open	59	171	27	201	186	168	154	138	
Services/Pregnancy (Preg.)	59	2.8	0.5	3.4	3.2	2.9	2.5	2.2	
Services/Pregnancy (All)	59	5.1	1.4	7.0	6.2	5.0	4.2	3.2	
Average Days Dry	59	69	7.2	77	74	68	64	60	
% Dry 40-70 Days	59	65	12	50	54	65	73	81	
Heats Observed	58	53	13	33	46	54	63	70	
% Successful	59	28	8.5	19	22	27	31	45	

Table 8. Measures of Reproductive Efficiency for All Herds in the Northeast Region by Herd Size.

Up to 50 cows								
					Percentile Rank			
	N	Mean	SD	10th	25th	50th	75th	90th
Days Open	1396	146	32	185	160	142	125	113
Days Dry	1396	66	9.4	77	71	65	60	56
% Dry 40-70 Days	1396	66	16	44	56	68	78	86

50 to 99 cows								
					Percentile Rank			
	N	Mean	SD	10th	25th	50th	75th	90th
Days Open	1986	150	32	187	164	144	128	117
Days Dry	1986	65	10	76	69	63	59	54
% Dry 40-70 Days	1986	66	16	44	56	68	79	86

100 to 149 cows								
					Percentile Rank			
	N	Mean	SD	10th	25th	50th	75th	90th
Days Open	569	150	31	186	162	144	129	118
Days Dry	569	65	13	76	69	62	58	54
% Dry 40-70 Days	569	66	16	42	55	68	78	85

150 to 249 cows								
					Percentile Rank			
	N	Mean	SD	10th	25th	50th	75th	90th
Days Open	341	148	28	185	160	141	131	120
Days Dry	341	63	9.0	73	67	62	57	54
% Dry 40-70 Days	341	69	15	48	60	73	81	86

250 to 349 cows								
					Percentile Rank			
	N	Mean	SD	10th	25th	50th	75th	90th
Days Open	129	145	30	179	155	139	127	119
Days Dry	129	63	13	71	66	62	58	55
% Dry 40-70 Days	129	72	14	55	66	75	82	87

350+ cows								
					Percentile Rank			
	N	Mean	SD	10th	25th	50th	75th	90th
Days Open	170	142	19	166	153	139	129	119
Days Dry	170	64	6.3	72	67	64	61	56
% Dry 40-70 Days	170	73	12	54	68	76	81	85

Table 9. Measures of Reproductive Efficiency for All Herds in the Midsouth Region by Herd Size.

Up to 50 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days Open	180	169	50	228	184	158	136	119	
Days Dry	180	72	16	91	78	70	63	57	
% Dry 40-70 Days	180	58	18	32	45	60	70	83	

50 to 99 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days Open	706	167	44	225	184	155	139	125	
Days Dry	706	70	13	85	75	67	61	57	
% Dry 40-70 Days	706	60	18	34	46	62	74	83	

100 to 149 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days Open	475	166	38	222	185	158	140	125	
Days Dry	475	70	12	86	75	67	62	58	
% Dry 40-70 Days	475	61	18	36	47	63	75	83	

150 to 249 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days Open	268	168	37	220	189	160	141	131	
Days Dry	268	69	13	84	75	66	60	56	
% Dry 40-70 Days	268	62	17	38	50	64	76	84	

250+ cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days Open	118	171	31	216	188	168	150	135	
Days Dry	118	68	10	81	74	66	62	59	
% Dry 40-70 Days	118	64	18	38	52	66	77	85	

Table 10. Measures of Reproductive Efficiency for All Herds in the Midwest Region by Herd Size.

Up to 50 cows								
					Percentile Rank			
	N	Mean	SD	10th	25th	50th	75th	90th
Days Open	753	175	52	547	200	162	139	121
Days Dry	753	64	11	76	69	63	57	52
% Dry 40-70 Days	753	63	18	39	50	64	78	87

50 to 99 cows								
					Percentile Rank			
	N	Mean	SD	10th	25th	50th	75th	90th
Days Open	1710	171	47	240	192	159	139	124
Days Dry	1710	65	12	77	70	63	58	52
% Dry 40-70 Days	1710	62	18	37	50	64	76	84

100 to 149 cows								
					Percentile Rank			
	N	Mean	SD	10th	25th	50th	75th	90th
Days Open	661	170	42	237	189	158	141	127
Days Dry	661	64	11	76	69	63	58	53
% Dry 40-70 Days	661	64	18	40	50	66	78	86

150 to 249 cows								
					Percentile Rank			
	N	Mean	SD	10th	25th	50th	75th	90th
Days Open	357	167	37	224	183	158	143	132
Days Dry	357	64	10	77	69	63	58	54
% Dry 40-70 Days	357	65	18	38	52	68	79	88

250+ cows								
					Percentile Rank			
	N	Mean	SD	10th	25th	50th	75th	90th
Days Open	220	162	30	197	176	158	143	130
Days Dry	220	64	9.2	74	69	63	59	55
% Dry 40-70 Days	220	68	15	48	58	71	79	84

Table 11. Measures of Reproductive Efficiency for All Herds in the South Region by Herd Size.

Up to 100 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days Open	131	180	49	229	209	178	148	136	
Days Dry	131	72	15	93	79	69	62	58	
% Dry 40-70 Days	131	58	19	30	42	60	71	80	

100 to 149 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days Open	154	183	43	240	207	174	157	136	
Days Dry	154	72	14	89	77	70	63	58	
% Dry 40-70 Days	154	54	16	31	41	53	66	77	

150 to 249 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days Open	195	184	39	235	200	175	159	145	
Days Dry	195	73	13	85	78	71	64	60	
% Dry 40-70 Days	195	54	16	31	42	54	66	76	

250 to 499 cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days Open	144	184	39	229	204	178	161	143	
Days Dry	144	70	10	84	77	69	63	59	
% Dry 40-70 Days	144	58	18	31	47	60	73	80	

500+ cows									
					Percentile Rank				
	N	Mean	SD	10th	25th	50th	75th	90th	
Days Open	117	178	28	213	196	176	157	143	
Days Dry	117	70	8.9	81	75	69	65	61	
% Dry 40-70 Days	117	60	15	38	51	62	71	78	

Table 12. Average Measures of Reproductive Efficiency by Region and Production Level.

Northeast							
Herd Average (lbs)	N	Days to 1st Service	Days Open	Services / Pregnancy (Pregnant Cows)	Services / Pregnancy (All Cows)	Days Dry	% Dry 40-70 Days
14000	18	97	172	2.1	2.9	74	56
15000	43	94	153	2.2	2.9	68	60
16000	84	86	157	2.2	3.0	66	62
17000	138	93	151	2.2	2.9	66	66
18000	219	93	150	2.2	3.0	65	64
19000	328	92	148	2.2	3.0	64	66
20000	361	90	144	2.2	3.0	64	70
21000	412	89	145	2.2	3.0	64	71
22000	328	89	146	2.3	3.1	63	72
23000	283	89	145	2.3	3.1	63	74
24000	197	87	145	2.3	3.3	63	75
25000	126	86	141	2.3	3.2	63	76
26000	71	90	148	2.4	3.5	62	74
27000	79	95	155	2.3	3.4	64	72

Midsouth							
Herd Average (lbs)	N	Days to 1st Service	Days Open	Services / Pregnancy (Pregnant Cows)	Services / Pregnancy (All Cows)	Days Dry	% Dry 40-70 Days
14000	18	117	202	2.2	3.1	79	47
15000	25	99	171	2.3	3.6	80	46
16000	44	99	169	2.3	3.4	71	64
17000	60	98	167	2.3	3.3	68	61
18000	101	99	169	2.3	3.6	69	65
19000	114	96	164	2.4	3.8	66	67
20000	123	92	160	2.4	3.8	66	72
21000	143	90	153	2.4	3.8	66	74
22000	96	92	150	2.3	3.5	65	74
23000	45	96	156	2.3	3.5	65	74
24000	70	88	157	2.4	4.1	65	76

Table 12. Average Measures of Reproductive Efficiency by Region and Production Level (continued).

Midwest							
Herd Average (lbs)	N	Days to 1st Service	Days Open	Services / Pregnancy (Pregnant Cows)	Services / Pregnancy (All Cows)	Days Dry	% Dry 40-70 Days
14000	20	111	175	2.1	2.6	75	53
15000	33	110	181	2.1	3.0	69	56
16000	70	101	165	2.2	3.0	66	62
17000	95	102	170	2.2	3.1	64	65
18000	139	99	161	2.2	3.1	66	64
19000	188	98	163	2.3	3.1	64	68
20000	233	96	158	2.3	3.2	64	69
21000	207	96	161	2.2	3.3	62	70
22000	200	94	150	2.2	3.2	62	72
23000	157	93	154	2.2	3.3	62	75
24000	109	89	149	2.3	3.5	63	78
25000	80	88	150	2.4	3.6	60	77
26000	54	94	153	2.4	3.6	30	75
27000	61	90	152	2.3	3.4	60	78

Midsouth							
Herd Average (lbs)	N	Days to 1st Service	Days Open	Services / Pregnancy (Pregnant Cows)	Services / Pregnancy (All Cows)	Days Dry	% Dry 40-70 Days
14000	7	103	199	2.2	3.2	76	38
15000	18	94	166	2.3	3.6	70	62
16000	29	90	176	2.7	4.5	70	62
17000	39	94	173	2.6	4.4	72	63
18000	40	97	181	2.5	4.1	74	62
19000	47	94	173	2.5	4.5	69	66
20000	39	91	170	2.4	4.2	68	68
21000	37	95	180	2.6	4.8	68	68
22000	76	92	169	2.6	4.5	65	71

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