



**ARIZONA AND NEW MEXICO
DAIRY NEWSLETTER**

**COOPERATIVE EXTENSION
The University of Arizona
New Mexico State University**

February 2008

THIS MONTH'S ARTICLE:

Putting the Transition Period into Perspective

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Jerome, ID 83338



Dairy Day is coming!

The 2008 Arizona Dairy Day will be
Thursday, April 3 at the Caballero Dairy -
2943 W. Harmon Road - Eloy, Arizona

Dairy Day and Golf details inside.



Putting the Transition Period into Perspective

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Summary

- The transition period is a high risk period for various health problems. However, most cows proceed through the transition period with few health problems.
- Cows that do have health problems are at greater risk for other problems.
- Cows can use energy reserves in early lactation to support milk production.
- Cows return to energy balance by 6 to 7 weeks in lactation.
- Dry matter intake, not milk yield, is the driving force behind energy balance in early lactation.
- Milk production is not related to body condition score or use of body reserves.

Introduction

The transition period has been extensively studied with numerous papers and reviews documenting the significant changes cows undergo. Almost every dairy publication contains articles describing some method to reduce the risk of acquiring metabolic disorders associated with the transition period. Rapid increases in glucose, amino acid, mineral, and fatty acid requirements occur during the transition period requiring significant adjustment in metabolism to support these needs (Bell, 1995). Sometimes these alterations to meet nutrient requirements fail and metabolic disorders such as milk fever and ketosis occur. Additional health problems such as dystocia, retained placenta and metritis are associated with parturition and thus occur during this critical period.

The constant level of writing about problems associated with the transition period suggests that most cows experience health problems. Risks of various diseases range from 0 to 16% (Kelton et al., 1998; USDA 1996, 2002, 2007). Looking at the percentage of cows that do not have health problem, however, puts the risk into a different light (Table 1). For instance, many would consider that most cows are at risk for milk fever. The current incidence rate (USDA 2007) is estimated to be 4.9%. Thus, over 95% of cows do **not** contract milk fever. In fact, except for clinical mastitis or lameness, the percentage of cows not having any health problems such as retained placenta, dystocia, metritis, ketosis, milk fever, and displaced abomasums (DA) is all over 90%. Of course, the health problems are identified by clinical symptoms and signs but in many cases subclinical effects of hypocalcemia, ketosis and mastitis are detrimental to productivity and profitability with possibly greater effects than their corresponding clinical disease (Erb, 1987; Dohoo and Martin, 1984).

Table 1. Percentage of cows without the identified health problems listed as determined from a survey of 13 agencies, organizations and systems involved in the recording of the diseases of dairy cattle from around the world and by a survey of producers in the United States¹

Health problem	Kelton et al 1998	USDA NAHMS		
		1996	2002	2007
Clinical mastitis	85.8	86.6	85.3	83.5
Lameness	93.0	89.5	88.4	86.0
Retained placenta	91.4	92.2	92.2	92.2
Dystocia, metritis	97.5	Not listed	96.3	97.2
Milk fever	93.5	94.1	94.8	95.1
Displaced abomasum	98.3	97.2	96.5	96.5
Ketosis	95.2	Not listed	Not listed	Not listed

¹Numbers were determined by differences from 100 of the incidence rates presented in the two publications. Another estimate (Jordan and Fourdraine, 1993) of cows not developing ketosis would be 96.3%.

Rates of clinical diseases (100 minus values in Table 1) do not directly reflect the actual numbers of animals with disease as a cow could have one or more of these various diseases. The risk of having one health disorder is frequently positively related to a greater risk of many other disorders (Gröhn et al., 1989). Thus, the actual number of individual cows with the listed health problems is less than the sum of incidences. The changes in the incidence of milk fever and DA from 1996 to 2007 improved even though milk production increased from 16,479 to 19,951 #/lactation. On the contrary, the incidence of clinical mastitis and lameness slightly worsened.

Impact of Energy Balance during Early Lactation

Most cows go through some period of negative energy balance during early lactation when feed consumption does not meet demands of milk production particularly in a similar time frame to most of the health problems occurring in cows. This period of negative energy balance has been associated with immunosuppression, periparturient diseases and increased times to first ovulation and first breeding. A period of negative energy balance should actually be expected for dairy cows. Unlike rodents and humans that rely little on energy reserves in early lactation (Bauman et al., 1985), and seals, bears and baleen whales that consume very little during lactation and rely almost entirely on energy mobilization from tissue stores (Ofstedal, 1993), cows increase feed intake rapidly during early lactation to supply most of their nutrient needs. Additional nutrients are derived from tissue mobilization. Several researchers have indicated that as cows are selected for greater milk production, they partition a greater portion of available energy to milk rather than body tissue accretion (Bines and Hart, 1982; Bauman et al., 1985; Veerkamp and Emmans, 1995). This concept has led to the perception that high producing cows mobilize more tissue and are in greater and more prolonged negative energy balance than lower

producing cows. Clearly, many of the health problems associated with the transition period occur most frequently during negative energy balance. Additionally, personal communications with dairy professionals indicate that there is a large diversity of opinions as to the expectations for the duration of negative energy balance. Similarly, many dairy professionals and producers feel that greater production is associated with a more prolonged period of negative energy balance. Greater understanding of the changes in energy balance that occur during early lactation are important for managing herd health, reproductive programs, and use of POSILAC[®].

Methods of Measuring

Energy balance can be determined by either direct or indirect calorimetry; however, these techniques are expensive, involve complicated equipment and are very labor intensive. A more common method to estimate energy balance calculates the difference between energy consumed and energy required for maintenance and milk production. Advantages of this method are that it can be done for long periods, such as for an entire lactation or portions of the lactation; and, no specialized equipment are required. The disadvantage is that the results are estimates and precision of the results is dependent on how accurately energy is calculated for consumed feeds, milk produced and that required for maintenance. The consequence of errors in accurately determining these values is dependent on the purpose of the studies in question. For instance, when comparing results of treatments within a study, errors that occur across all treatments may not be as critical as when comparing results between experiments because different types of experimental error, or bias, may exist.

Energy Balance during Early Lactation

In order to investigate the energy balance profile during early lactation with high-producing dairy cows, a study was conducted in Idaho using 29 multiparous cows. These cows were studied for the first 12 weeks of lactation. Energy balance was calculated by determining NE_L Consumed (DM intake \times NE_L /lb DM) minus NE_L Requirement (NE_L for maintenance + NE_L for milk). Body weights and body condition scores were obtained weekly.

The average milk production during the experimental period was 102 pounds/d. In spite of the high production of these cows, they reached positive energy balance by an average of four weeks following calving (Figure 1). In a review (Brixey, 2005) of 26 studies with energy balance data, positive energy balance was reached approximately 50 days in milk with the minimum energy balance about 11 days in milk.

Dry matter intake for the Idaho study cows averaged 58 pounds/d. Because energy balance is calculated from energy intake and energy retained in milk, it seems reasonable that both of these would contribute to the time it takes cows to return to positive energy balance. For all cows, however, the correlation between intake and energy balance was greater than between milk and energy balance (Table 2). These data suggest that the greater feed consumption had a larger effect on energy balance than did the greater amount of milk production. This should be expected based on the relationship among these variables. During the first 12 weeks of lactation, both DM intake and energy balance are increasing whereas milk yield has peaked and either

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plateaued or already begun to decrease. Therefore, it is important to manage cows to maximize feed consumption in early lactation because DM intake accounts for considerably more variation in energy balance than does milk production.

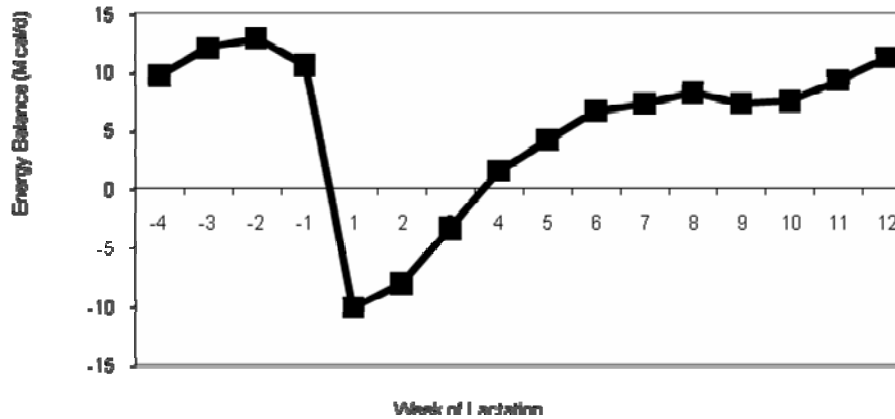


Figure 1. Energy balance of cows ($n = 29$) in early lactation (McGuire, unpublished data).

Table 2. Simple Correlations Between Intake, Milk Production, Body Condition Score (BCS) and Energy Balance			
	DM Intake	Milk Yield	BCS
Energy Balance	$P < .0001$ $r = 0.751$	$P < .037$ $r = 0.051$	$P < .017$ $r = -0.136$
DM Intake		$P < .0001$ $r = 0.511$	$P < .009$ $r = -0.148$
Milk Yield			$P < .0001$ $r = -0.327$

From McGuire (unpublished data).

Body condition score was not well correlated with energy balance. This is not surprising for two reasons. First, a single BCS gives no indication of whether a cow is gaining or losing body reserves at that time. The second reason is based on the fact that body condition scoring is primarily an assessment of subcutaneous tissue change. When a cow begins to replenish mobilized tissue, abdominal fat and intermuscular fat are replenished before subcutaneous fat. These fat depots are not evaluated (they are not visible) in the body condition scoring procedure. Intermuscular and abdominal fat contribute significantly to the total energy available for mobilization (Butler-Hogg et al., 1985). Thus, although the cow is in positive energy balance and is replenishing body tissue, gain in BCS is not apparent until later in lactation.

Relationships Between Milk Production and Use of Body Reserves

Theurer et al. (2003) further evaluated the relationship between milk production and use of body reserves in 3 commercial herds in central Washington. Use of body reserves was estimated by maximal decrease in BCS. Cows ($n = 252$) were scored before calving then monthly until 150 DIM. The minimum BCS was reached by the second month of lactation indicating that further use of body reserves was minimal as the cows were in energy balance (Figure 3). Linear regression analysis did not detect any relationship between peak milk yield and close up BCS (Figure 4) or change in BCS from close up to minimum BCS postpartum. To further evaluate whether BCS had any effect on milk production, cows were grouped for analysis based upon close up BCS or maximal postpartum change in BCS (Table 3). Neither peak milk nor total milk production through 150 DIM (Figure 4) was affected by BCS at calving. Further, change in BCS was not associated with milk production (Figure 5). Therefore, cows can use a combination of mechanisms (consume more feed or use body reserves) to meet the energy demand of early lactation in the production of substantial quantities of milk. But, to date, milk production does not seem to be limited by extent of change in BCS.

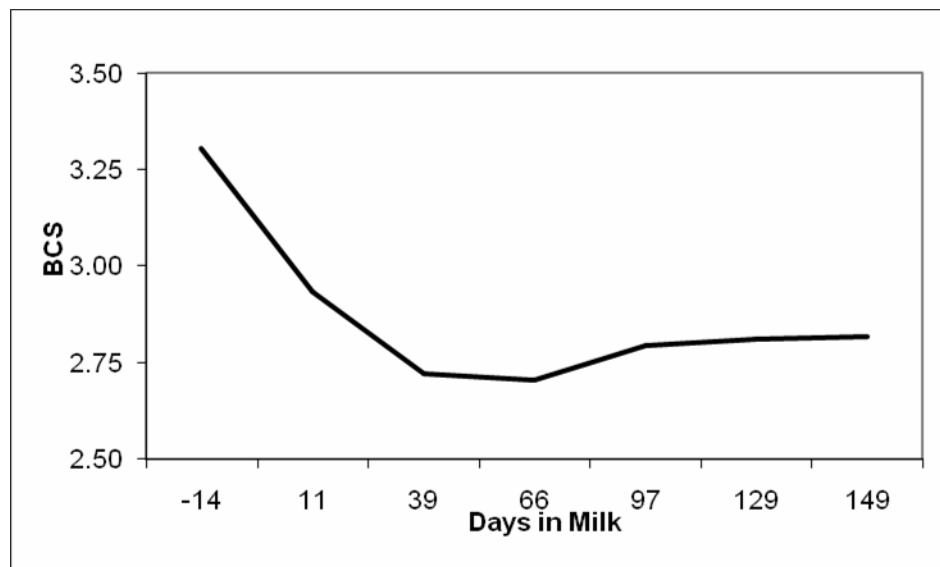


Figure 3. Average body condition score from 14 days prepartum until 149 days in milk. Cows ($n = 252$) were evaluated every 2 weeks from approximately 2 weeks before expected calving until 150 days in milk (Theurer et al., 2003).

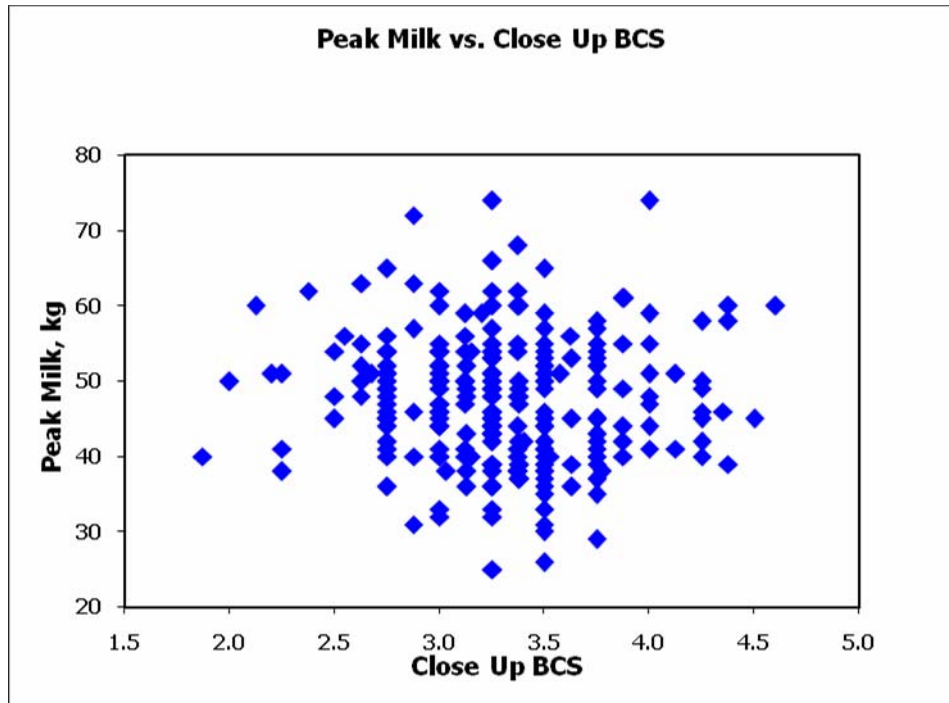


Figure 4. The relationship between close up BCS and peak milk production. No significant linear regression was detected for peak milk by close up BCS and the fit (r^2) of the regression was 0.0057 (Theurer et al., 2003).

Table 3. Description of body condition score (BCS) groups used in statistical evaluation

BCS Group	Close up BCS	Change in BCS
High	>3.5 ($n = 65$)	>0.75 ($n = 91$)
Mid	3.0 to 3.5 ($n = 110$)	0.5 to 0.75 ($n = 73$)
Low	<3.0 ($n = 77$)	<0.5 ($n = 88$)

From Theurer et al. (2003).

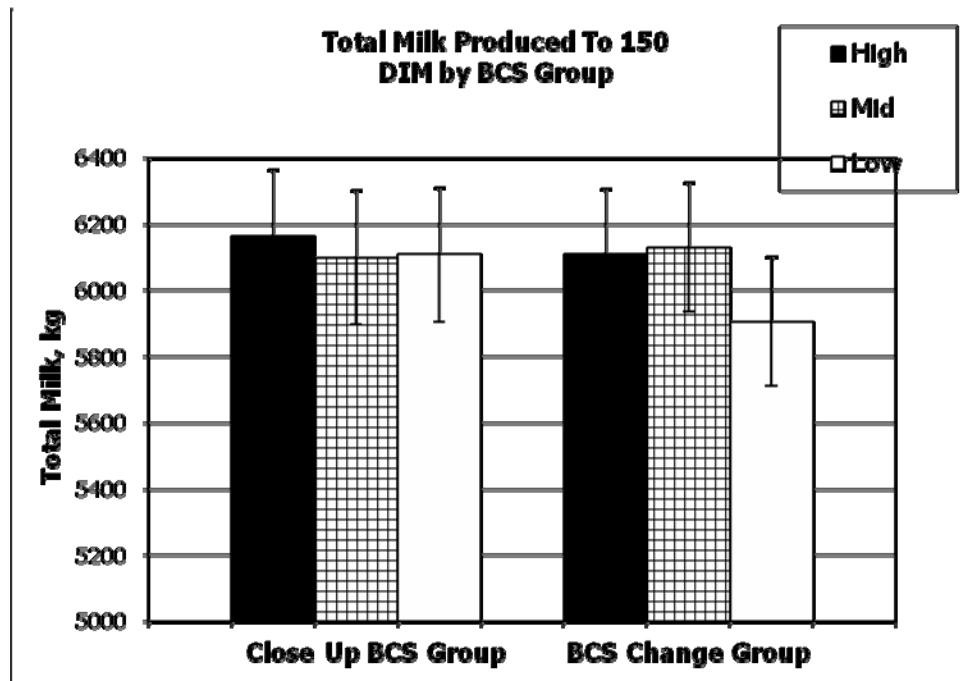


Figure 5. The relationship between close up BCS or change in BCS from close up to minimum observed postpartum and total milk production through 150 days in milk (From Theurer et al., 2003). The BCS groups are as defined in Table 3. Vertical bars represent the standard errors of the mean for each group.

Summary

The incidence of health problems in dairy cows is significant but might be less a problem than actually suggested by the preponderance of publications on the topic. Trends for the past 10 years in the United States suggest that health problems, other than clinical mastitis and lameness, are improving even with increasing milk production. High production itself does not appear to negatively impact energy balance in early lactation. High producing cows partition considerable amounts of energy towards milk production throughout lactation making a determination of energy balance based on BCS impossible. These data indicate that major goals for managing high producing cows should be to manage transition cows during lactation to optimize health and maximize feed consumption. Cows though can choose to either eat more or mobilize reserves to meet their nutrient requirements.

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HIGH COW REPORT

January 2008

MILK

Arizona Owner	Barn#	Age	Milk	New Mexico Owner	Barn #	Age	Milk
*Stotz Dairy	22,249	03-02	37,430	Pareo Dairy	382	9-00	36,453
*Stotz Dairy	20,589	04-07	37,050	S.A.S. Dairy	7,985	4-11	36,228
*Stotz Dairy	17,899	05-11	36,770	S.A.S. Dairy	7,978	4-11	36,207
*Zimmerman Dairy	856	05-09	36,640	Pareo Dairy	4,866	5-09	35,349
*Stotz Dairy	8,454	04-06	36,470	S.A.S. Dairy	5,872	7-04	34,647
*Stotz Dairy	18,681	05-03	36,120	Mccatharn North	2,177	4-02	34,557
*Rio Blanco Dairy	7,047	04-07	35,630	*Wayne Palla Dairy	9,138	6-06	34,020
*Stotz Dairy	21,948	03-05	35,620	S.A.S. Dairy	8,007	4-11	33,786
*Stotz Dairy	21,091	04-03	35,530	S.A.S. Dairy	7,797	5-02	33,661
*Stotz Dairy	8,453	04-05	35,410	S.A.S. Dairy	8,623	4-00	33,477

FAT

*Stotz Dairy	22,249	03-02	1,631	*Goff Dairy #2	2,211	3-04	2,696
*Stotz Dairy	22,212	03-03	1,587	*Goff Dairy #2	5,640	3-04	1,523
*Stotz Dairy	20,737	04-05	1,561	*Goff Dairy #2	4,959	6-06	1,663
*Stotz Dairy East	20,793	04-04	1,483	*Goff Dairy	23,001	3-04	1,426
*Shamrock Farms	9,288	05-06	1,483	*Goff Dairy	19,395	5-06	1,358
*Shamrock Farms	12,651	04-03	1,429	*Goff Dairy #2	2,210	3-04	1,331
*Stotz Dairy	21,142	04-02	1,413	*Goff Dairy #2	7,573	4-03	1,323
*Stotz Dairy	18,878	05-02	1,411	*Goff Dairy	19,828	5-06	1,316
*Stotz Dairy	21,156	04-01	1,403	*Goff Dairy #2	4,073	5-06	1,316
*Shamrock Farms	11,162	04-11	1,369	*Vaz Dairy	3,212	5-02	1,292

PROTEIN

*Stotz Dairy	22,249	03-02	1,073	*Goff Dairy #2	2,211	3-04	1,217
*Stotz Dairy East	20,793	04-04	1,067	*Goff Dairy	24,835	5-06	1,191
*Danzeisen Dairy 2	885	04-08	1,067	*Goff Dairy #2	5,436	3-04	1,160
*Stotz Dairy	8,454	04-06	1,066	*Goff Dairy #2	4,959	6-06	1,146
*Shamrock Farms	9,288	05-06	1,045	S.A.S. Dairy	7,985	4-11	1,135
*Stotz Dairy	21,156	04-01	1,043	*Goff Dairy #2	7,573	4-03	1,119
*Stotz Dairy	18,878	05-02	1,042	S.A.S. Dairy	7,797	5-02	1,091
*Stotz Dairy	21,143	04-01	1,037	S.A.S. Dairy	3,966	8-09	1,073
*Stotz Dairy	17,899	05-11	1,030	S.A.S. Dairy	7,978	4-11	1,053
*Stotz Dairy	22,212	03-03	1,030	S.A.S. Dairy	8,623	4-00	1,041
*Stotz Dairy	8,453	04-05	1,027				

*all or part of lactation is 3X or 4X milking

ARIZONA - TOP 50% FOR F.C.M.^b JANUARY 2008

<u>OWNERS NAME</u>	<u>Number of Cows</u>	<u>MILK</u>	<u>FAT</u>	<u>3.5 FCM</u>	<u>CI</u>
*Stotz Dairy West	2,278	28,796	1,056	29,569	15
*Red River Dairy	9,734	26,789	897	26,124	
*Danzeisen Dairy, Inc.	1,493	25,484	928	26,062	15
*Stotz Dairy East	1,281	24,497	891	25,036	16
*Goldman Dairy	2,392	24,348	840	24,144	14
*Zimmerman Dairy	1,289	23,641	843	23,887	14
*Arizona Dairy Company	5,576	23,422	844	23,809	
*Butler Dairy	622	23,733	833	23,765	
*Mike Pylman	6,553	23,568	836	23,742	15
*Parker Dairy	4,555	22,495	847	23,457	15
Paul Rovey Dairy	296	22,844	809	22,992	13
*Withrow Dairy	5,324	22,856	800	22,851	13
*Shamrock Farms	8,238	22,846	779	22,506	14

NEW MEXICO - TOP 50% FOR F.C.M.^b JANUARY 2008

<u>OWNERS NAME</u>	<u>Number of Cows</u>	<u>MILK</u>	<u>FAT</u>	<u>3.5 FCM</u>	<u>CI</u>
*SAS	1,945	28,730	971	28,169	13
MCatharn	1,068	27,429	940	27,103	13
Pareo	3,525	26,518	915	26,304	13
*Pareo 2	1,633	25,495	930	26,105	13
*Butterfield	2,105	25,894	872	25,337	13
*Do-Rene	2,301	24,687	883	24,993	13
*Red Roof	1,611	25,686	852	24,923	13
*Hide Away	2,859	24,958	844	24,478	12
*Milagro	3,481	23,801	874	24,464	13
*Providence	3,056	23,835	854	24,155	13
Vaz 2	1,969	22,942	857	23,817	14
*Vaz	2,011	22,866	853	23,720	14
*Goff	5,581	23,435	819	23,414	13
Cross Country	3,120	23,161	804	23,052	13

* all or part of lactation is 3X or 4X milking

^b average milk and fat figure may be different from monthly herd summary; figures used are last day/month

ARIZONA AND NEW MEXICO HERD IMPROVEMENT SUMMARY FOR OFFICIAL HERDS TESTED JANUARY 2008

		ARIZONA	NEW MEXICO
1.	Number of Herds	33	26
2.	Total Cows in Herd	67,154	58,946
3.	Average Herd Size	2,035	2,267
4.	Percent in Milk	88	87
5.	Average Days in Milk	201	199
6.	Average Milk – All Cows Per Day	58.2	60.7
7.	Average Percent Fat – All Cows	3.7	3.7
8.	Total Cows in Milk	59,322	19,429
9.	Average Daily Milk for Milking Cows	67.5	69.4
10.	Average Days in Milk 1st Breeding	83	75
11.	Average Days Open	171	147
12.	Average Calving Interval	14.5	14.08
13.	Percent Somatic Cell – Low	83	85
14.	Percent Somatic Cell – Medium	11	11
15.	Percent Somatic Cell – High	6	5
16.	Average Previous Days Dry	64	64
17.	Percent Cows Leaving Herd	32	33
		STATE AVERAGES	
	Milk	22,282	22,460
	Percent butterfat	3.68	3.67
	Percent protein	2.93	3.17
	Pounds butterfat	820	857
	Pounds protein	650	677



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Upcoming Event

Arizona Dairy Day - Thursday, April 3, 2008

Caballero Dairy Farms - Eloy, Arizona

Arizona Dairy Day Golf - Friday, April 4, 2008

Club West Golf Club - Phoenix, Arizona

