

**UNITED STATES DEPARTMENT OF AGRICULTURE**

1930-220th St. SE, Ste. 102  
Bothell, WA 98021-8471  
Phone: (425) 487-6009  
Fax: (425) 487-2775  
E-mail: [fmaseattle@fmaseattle.com](mailto:fmaseattle@fmaseattle.com)

Agricultural Marketing Service  
Dairy Programs  
FEDERAL MILK ORDERS 124, 131 & 135

10050 N 25th Ave., Ste. 302  
Phoenix, AZ 85021-1664  
Phone: (602) 547-2909  
Fax: (602) 547-2906  
E-mail: [ma@fmma.net](mailto:ma@fmma.net)

**ANALYSIS OF COMPONENT LEVELS IN INDIVIDUAL  
HERD MILK AT THE FARM LEVEL**

**PACIFIC NORTHWEST, ARIZONA-LAS VEGAS, AND  
WESTERN FEDERAL MILK MARKETING ORDERS**

**2002**

Staff Paper 03-01

Chris Werner

September 2003

The United States Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write the USDA, Director, Office of Civil Rights, Room 326W, Jamie L. Whitten Building, 14<sup>th</sup> and Independence Avenue, SW., Washington, D.C. 20250-9410, or call (202) 720-5964 (voice or TDD). USDA is an Equal Opportunity provider and employer.

# ANALYSIS OF COMPONENT LEVELS IN INDIVIDUAL HERD MILK AT THE FARM LEVEL

## PACIFIC NORTHWEST, ARIZONA-LAS VEGAS, AND WESTERN FEDERAL MILK MARKETING ORDERS

2002

Chris Werner

### Abstract

Component levels in producer milk pooled on the Pacific Northwest (FO 124), Arizona-Las Vegas (FO 131), and Western (FO 135) Federal Milk Marketing Orders were analyzed for 2002 to determine average levels, regional and seasonal variation, and, when possible, the statistical relationship between components. Handlers regulated under the Pacific Northwest and Western Orders report butterfat, protein, and other solids. Handlers regulated under the Arizona-Las Vegas Order report butterfat only. Producer milk pooled was also valued using Federal order minimum producer prices for the respective orders. For 2002, a monthly average total of 1,930 producers were pooled on the Pacific Northwest, Arizona-Las Vegas, and Western Orders. During 2002, these producers delivered 16.4 billion pounds to the three markets. The milk shed of the three Federal orders includes Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, Oklahoma, Oregon, Utah, and Washington.

Major findings of this study include:

1. The 2002 average component levels for the Pacific Northwest Order were 3.68% butterfat, 3.05% true protein, and 5.71% other solids. The 2002 average component levels for the Western Order were 3.63% butterfat, 3.06% true protein, and 5.72% other solids. The 2002 average butterfat level for the Arizona-Las Vegas Order was 3.63%.
2. In all three orders, butterfat and protein levels decrease during the summer months and increase in the late fall and winter.
3. Although the volume of producer milk, number of producers, and average milk production per producer varies greatly between regions, there are only small differences in aggregate component levels between geographic regions within the milk shed of the three orders.
4. The Pacific Northwest Order's linear regression in 2002 for protein is  $PRO\% = 1.49 + 0.426 * BF\%$ , with an R-squared of 0.65. The Western Order's linear regression in 2002 for protein is  $PRO\% = 1.59 + 0.415 * BF\%$ , with an R-squared of 0.49.
5. The Pacific Northwest and Western Orders' regressions for estimating other solids using butterfat have a very poor correlation (R-squared of less than 0.05). The monthly regression varies between a positive and negative relationship; other solids levels appear to be independent of butterfat levels.

## TABLE OF CONTENTS

Section	Page Number
I. INTRODUCTION .....	1
II. DATA AND METHODOLOGY .....	2
III. SEASONAL VARIATION IN MILK COMPONENT LEVELS .....	3
Table 1: Monthly Component Levels, Pacific Northwest Order, 2002 .....	4
Table 2: Monthly Component Levels, Western Order, 2002 .....	4
Table 3: Monthly Component Levels, Arizona-Las Vegas Order, 2002 .....	5
Table 4: Component Levels: Weighted Average, Mean, Median, Standard Deviation, Minimum, and Maximum, Pacific Northwest Order, 2002 ..	6
Table 5: Component Levels: Weighted Average, Mean, Median, Standard Deviation, Minimum, and Maximum, Western Order, 2002 .....	6
Table 6: Component Levels: Weighted Average, Mean, Median, Standard Deviation, Minimum, and Maximum, Arizona-Las Vegas Order, 2002 .....	6
IV. REGIONAL VARIATION IN MILK COMPONENT LEVELS .....	7
Table 7: Various Statistics by Region For 2002 .....	8
V. STATISTICAL RELATIONSHIP AMONG MILK COMPONENTS .....	9
Table 8: Pacific Northwest and Western Orders, Comparison of Regression Results: Butterfat Levels as a Predictor of Protein Levels, 1997 through 2002 .....	10
VI. MINIMUM ORDER VALUE OF PRODUCER MILK .....	10
VII. SUMMARY .....	11

Tables:	A-1	Statistical Data for Producers on the Pacific Northwest Order Included in Component Analysis, 2002 .....	13
	A-2	Statistical Data for Producers on the Western Order Included in Component Analysis, 2002 .....	15
	A-3	Statistical Data for Producers on the Arizona-Las Vegas Order Included in Component Analysis, 2002 .....	17
	A-4	Weighted Average Component Levels By Region, 2002.....	18
	A-5	Linear Relationships Between Various Milk Components, 2002 ..	21
	A-6	Monthly Producer Component Prices, 2002 .....	22
	A-7	Aggregated Component Tests By Size Range of Producer Milk Deliveries, 2002 .....	23
	A-8	Aggregated Component Values By Size Range of Producer Milk Deliveries, 2002.....	25
Figures:	A-1	Frequency Distribution of Monthly Average Butterfat Levels, Pacific Northwest Order, 2002 .....	27
	A-2	Frequency Distribution of Monthly Average Protein Levels, Pacific Northwest Order, 2002 .....	27
	A-3	Frequency Distribution of Monthly Average Other Solids Levels, Pacific Northwest Order, 2002 .....	28
	A-4	Frequency Distribution of Monthly Average Butterfat Levels, Western Order, 2002 .....	28
	A-5	Frequency Distribution of Monthly Average Protein Levels, Western Order, 2002 .....	29
	A-6	Frequency Distribution of Monthly Average Other Solids Levels, Western Order, 2002 .....	29
	A-7	Frequency Distribution of Monthly Average Butterfat Levels, Arizona-Las Vegas Order, 2002 .....	30
	A-8	Scatter Plot of Protein and Butterfat, Pacific Northwest Order, May and November, 2002 .....	31
	A-9	Scatter Plot of Protein and Butterfat, Western Order, May and November, 2002 .....	32
	A-10	Scatter Plot of Other Solids and Butterfat, Pacific Northwest Order, May and November, 2002.....	33
	A-11	Scatter Plot of Other Solids and Butterfat, Western Order, May and November, 2002 .....	34
	A-12	Weighted Average Component Levels By Size Range of Producer Milk Deliveries, 2002 .....	35
	A-13	Weighted Average Values and Percent of Producer Milk By Size Range of Producer Milk Deliveries, 2002 .....	37

Maps:	A-1 Marketing Areas of the Pacific Northwest, Arizona-Las Vegas, and Western Orders .....	39
	A-2 Geographic Regions Encompassing the Pacific Northwest, Arizona-Las Vegas, and Western Order Milksheds .....	40

# **ANALYSIS OF COMPONENT LEVELS IN INDIVIDUAL HERD MILK AT THE FARM LEVEL**

## **PACIFIC NORTHWEST, ARIZONA-LAS VEGAS, AND WESTERN FEDERAL MILK MARKETING ORDERS**

**2002**

Chris Werner <sup>1/</sup>

### **I. INTRODUCTION**

This study examines milk component levels in milk pooled on the Pacific Northwest (FO 124), Arizona-Las Vegas (FO 131), and Western (FO 135) Milk Marketing Orders during 2002. The milk components include butterfat, protein, and other solids. Protein and other solids were not included in any analyses concerning the Arizona-Las Vegas Order because they were not used as a basis for pricing milk in 2002, and handlers were not obligated under the order to report information on protein and other solids levels.

Component levels in producer milk pooled on the Pacific Northwest, Arizona-Las Vegas, and Western Orders were analyzed to determine average component levels, regional and seasonal variation, and the statistical relationship between components. Producer milk pooled on each order in 2002 was valued using Federal order minimum producer prices for the respective orders.

For 2002, a monthly average total of 1,930 producers were pooled on the Pacific Northwest, Arizona-Las Vegas, and Western Orders. During 2002, these producers delivered 16.4 billion pounds to the three markets.

Beginning January 2000, true protein was used as a basis for pricing milk under the Pacific Northwest and Western Orders. Prior to January 2000, crude (Total Nitrogen) protein was used. True protein does not include non-protein nitrogen which is included in crude protein. Due to this change, references to protein levels prior to January 2000 are not directly comparable to protein levels after January 2000 without taking into account the effects of the change in testing for protein. In general, crude protein test levels are about 0.19 percentage points higher than true protein test levels. In a like manner, other solids levels associated with true protein levels are about 0.19 percentage points higher than those associated with crude protein test levels.

During 2002, the Pacific Northwest Order milk shed was comprised of producers located in Washington, Oregon, California, Idaho, Colorado, Utah, Oklahoma, Nebraska, and Kansas. The Western Order milk shed was comprised of producers located in Southern Idaho, Utah, California, Eastern Oregon, Montana, Nevada, and Colorado. The Arizona-Las Vegas milk shed was comprised of producers located in Arizona and California. The milk shed of the three orders includes various geographic and climatic regions. These regions range from very dry climates

---

<sup>1/</sup> Chris Werner is an Agricultural Economist with the Market Administrator Office, Bothell, Washington.

(Arizona, Central Washington, Southern Idaho, and Eastern Oregon) to very wet climates (western and coastal regions of Oregon and Washington). Geographically, the Cascade Mountain Range, Pacific Ocean, Rocky Mountain Range, and Columbia River provide general geographic and climate demarcations that may impact how dairy operations are managed.

## II. DATA AND METHODOLOGY

The data included in this study comprises all producer milk pooled on the Pacific Northwest, Arizona-Las Vegas, and Western Orders. The data was collected from producer payrolls submitted by handlers to the market administrator's office. Components available for the Pacific Northwest and Western Orders were butterfat, protein, and other solids (other solids is nonfat solids less protein). Protein and other solids were not included for the Arizona-Las Vegas Order because they were not used as a basis for pricing milk in 2002, and handlers were not obligated under the order to report information on protein and other solids levels. Up until February 1997, the Pacific Northwest Order did not require handlers to report protein and other solids. Under the previous pricing system, butterfat and nonfat solids were the components used in determining minimum order values. Any reference to 1997 annual averages for protein and other solids for the Pacific Northwest Order does not include data for January 1997.

Eligible producer milk and producers which were **not** pooled were not included in this analysis. Eligible producer milk is Grade A milk production that qualifies to be but is not pooled on the respective order. The exclusion of milk not pooled was due to the unavailability of the information, and it often represented one handler and was, therefore, restricted. Partial pooling of a producer's monthly milk production to maintain producer qualification on the Western Order was treated as a full month's production. When inter-order pooling of producers occurred, each order was treated separately, and each producer was accounted for on that portion of milk that was pooled on that order. Examination of the data did not reveal that this treatment was a source of distortion or bias.

The Pacific Northwest, Arizona-Las Vegas, and Western Orders were divided into ten regions. (See Map A-2.) The small number of producers in Northern California pooled on the Pacific Northwest Order made it necessary to combine them with another region (Western Oregon, Region 5). Region 5 has a similar climate and was geographically adjacent to the two California counties. Utah, Colorado, Kansas, Montana, Nebraska, and Nevada were combined for reasons of confidentiality. The Arizona, Oklahoma, and central/southern California producers were also combined for reasons of confidentiality. Other than the identified exceptions, order and/or state lines were considered as primary boundaries. The regions within states were defined based on climatic conditions and geography. The regions are as follows: Western Washington (Region 1), Central Washington (Region 2), Eastern Washington (Region 3), Northern Idaho (Region 4), Western Oregon/Northern California (Region 5), Central Oregon (Region 6), Eastern Oregon (Region 7), Southern Idaho and Wyoming (Region 8), Utah/Nevada/other states (Region 9), and Arizona/South-Central California/Oklahoma (Region 10).

In Oregon and Washington, the west side of the Cascade Mountain Range has more precipitation and is characterized by a milder climate than the eastern side of the states<sup>1</sup>. The region east of the Cascade Mountain Range has a drier climate with warmer summers and colder winters. In Eastern Washington, the precipitation rate begins to increase slightly. Idaho has two distinct regions split by the orders: Northern Idaho is in the Pacific Northwest Order, while Southern Idaho is in the Western Order. Northern Idaho is wetter and more mountainous compared to Southern Idaho. Utah, in comparison to Southern Idaho, has regions of higher elevation and increased precipitation. Arizona is very dry year round with much less precipitation and many days with average temperatures much higher than the other regions studied.

Ordinary Least Squares regression analysis was used to determine relationships between components.

Monthly Federal order minimum producer prices specific to the Pacific Northwest, Arizona-Las Vegas, and Western Orders were used in the determination of the value of milk production.

### III. SEASONAL VARIATION IN MILK COMPONENT LEVELS

In 2002, producers associated with the Pacific Northwest Order delivered 7,824.6 million pounds, but not all eligible milk was pooled. (See asterisked months in Table 1.) For 2002, producer milk tested, on average, 3.68% butterfat, 3.05% protein, and 5.71% other solids.

In the Pacific Northwest Order, the butterfat percent decreases in the spring and increases again in the fall and winter. Table 1 shows the monthly and annual average component levels for the Pacific Northwest Order. Milk production per cow typically is less, and animals are fed more stored feed in the fall and winter. In the spring, during the flush of milk production, the feeding of more fresh grass increases the total pounds produced but decreases the percentage butterfat content of milk. The spring flush is additionally impacted by the biological cycle of cows and the increase in temperature in the spring. Butterfat levels in the Pacific Northwest Order in 2002 were the highest in November at 3.79% and lowest in July at 3.57%. The seasonal cycle of protein levels is similar to butterfat but with a lesser degree of variation. Protein levels in 2002 were highest in November at 3.13% and lowest in July at 2.97%. Other solids levels were much more consistent throughout the year when compared to the seasonal changes in butterfat and protein levels. Other solids levels reached a peak of 5.74% in April and May, and a low of 5.68% in September, October, and November, and showed very little seasonality.

In 2002, producers associated with the Western Order delivered 5,541.2 million pounds, but not all eligible milk was pooled. (See asterisked months in Table 2.) For 2002, producer milk tested, on average, 3.63% butterfat, 3.06% protein, and 5.72% other solids.

---

<sup>1</sup> Climate information based on Western Regional Climate Center precipitation maps.



**Table 1**  
**Monthly Component Levels**  
**Pacific Northwest Order**  
**2002**

Month	Butterfat - percent -	Protein - percent -	Other Solids - percent -
January	3.72	3.07	5.70
February	3.72	3.06	5.71
March	3.72	3.06	5.71
April	3.67	3.03	5.74
May	3.61	3.00	5.74
June	3.58	2.98	5.73
July	3.57	2.97	5.71
August	3.60	3.01	5.70
September	3.67	3.06	5.68
October *	3.75	3.12	5.68
November *	3.79	3.13	5.68
December *	3.74	3.08	5.69
Weighted Average	3.68	3.05	5.71

\* Eligible milk not pooled.

**Table 2**  
**Monthly Component Levels**  
**Western Order**  
**2002**

Month	Butterfat - percent -	Protein - percent -	Other Solids - percent -
January *	3.74	3.12	5.71
February *	3.73	3.10	5.72
March *	3.68	3.07	5.72
April	3.61	3.04	5.74
May *	3.55	3.02	5.74
June	3.50	2.98	5.74
July *	3.48	2.96	5.75
August *	3.51	3.02	5.73
September *	3.61	3.06	5.70
October *	3.70	3.14	5.68
November *	3.76	3.16	5.69
December *	3.74	3.13	5.70
Weighted Average	3.63	3.06	5.72

\* Eligible milk not pooled.

**Table 3**  
**Monthly Component Levels**  
**Arizona-Las Vegas Order**  
**2002**

Month	Butterfat - percent -
January	3.73
February	3.66
March	3.59
April	3.56
May	3.56
June	3.59
July	3.59
August	3.59
September	3.64
October	3.66
November	3.70
December	3.70
Weighted Average	3.63

Component levels in the Western Order follow a similar seasonal pattern as the Pacific Northwest Order. The butterfat and protein levels decrease in the spring and rise again in the fall. (See Table 2 on the previous page.) Butterfat levels in the Western Order in 2002 were highest in November at 3.76% and lowest in July at 3.48%. Protein levels in 2002 were also highest in November at 3.16% and lowest in July at 2.96%. Other solids levels were much more consistent throughout the year when compared to the seasonal changes in butterfat and protein levels. Other solids had a high of 5.75% in July, and a low of 5.68% in October and showed very little seasonality.

In 2002, producers associated with the Arizona-Las Vegas Order delivered 3,026.6 million pounds. For 2002, producer milk tested, on average, 3.63% butterfat. Butterfat levels in the Arizona-Las Vegas Order follow a similar seasonal pattern as the Pacific Northwest and Western Orders. The butterfat levels decrease in the spring and rise again in the fall. (See Table 3 above.) Butterfat levels in the Arizona-Las Vegas Order in 2002 were highest in January at 3.73% and lowest in April and May at 3.56%. The highs and the lows of butterfat occurred roughly two months later in the Arizona-Las Vegas Order than the Pacific Northwest and Western Orders.

For 2002, the monthly and annual weighted average butterfat and protein levels were less than the mean averages for both components. (See Table 4, 5, and 6 and Appendix Tables A-1, A-2, and A-3.) The relative levels of the weighted average and the mean would indicate that individual producers who deliver smaller amounts of milk (on a monthly basis) have higher levels of these components in their milk than their larger counterparts. Conversely, on the Pacific Northwest and Western

**Table 4**  
**Component Levels: Weighted Average, Mean, Median,**  
**Standard Deviation, Minimum, and Maximum**  
**Pacific Northwest Order**  
**2002**

	Butterfat	Protein	Other Solids
	%	%	%
Weighted Average	3.68	3.05	5.71
Mean	3.78	3.10	5.68
Median	3.70	3.06	5.69
Standard Deviation	0.36	0.19	0.09
Minimum	2.38	2.51	4.61
Maximum	6.11	4.31	6.04

**Table 5**  
**Component Levels: Weighted Average, Mean, Median,**  
**Standard Deviation, Minimum, and Maximum**  
**Western Order**  
**2002**

	Butterfat	Protein	Other Solids
	%	%	%
Weighted Average	3.63	3.06	5.72
Mean	3.69	3.12	5.69
Median	3.65	3.09	5.70
Standard Deviation	0.31	0.18	0.11
Minimum	2.69	2.58	4.64
Maximum	5.55	4.14	6.39

**Table 6**  
**Component Levels: Weighted Average, Mean, Median,**  
**Standard Deviation, Minimum, and Maximum**  
**Arizona-Las Vegas Order**  
**2002**

	Butterfat
	%
Weighted Average	3.63
Mean	3.65
Median	3.62
Standard Deviation	0.27
Minimum	2.99
Maximum	4.92

Orders, the other solids weighted average is higher than the mean, indicating that producers who deliver larger amounts of milk have higher levels of other solids in their milk than their smaller counterparts.

During 2002, for the Pacific Northwest Order, producers' individual monthly average butterfat tests ranged from 2.38% to 6.11%; protein tests ranged from 2.51% to 4.31%, and other solids levels ranged from 4.61% to 6.04%. (See Table 4.) Most monthly average component tests are within one standard deviation of the mean<sup>2</sup>. Based on the definition of a standard deviation, most producers had butterfat tests ranging from 3.42% to 4.14%. Similarly, most protein tests ranged from 2.91% to 3.29%, and most other solids tests ranged from 5.59% to 5.77%. (See Appendix Table A-1 for monthly component statistics.)

In 2002, Western Order producer butterfat tests ranged from 2.69% to 5.55%, protein tests ranged from 2.58% to 4.14%, and other solids tests ranged from 4.64% to 6.39%. (See Table 5.) Based on the definition of a standard deviation, most producers had butterfat tests ranging from 3.38% to 4.00%. Similarly, most protein tests ranged from 2.94% to 3.30%, and most other solids tests ranged from 5.58% to 5.80%. (For monthly component statistics, see Appendix Table A-2.)

In 2002, Arizona-Las Vegas Order producer butterfat tests ranged from 2.99% to 4.92%. (See Table 6.) Based on the definition of a standard deviation, most producers had butterfat tests ranging from 3.38% to 3.92%. (See Appendix Table A-3 for monthly component statistics.)

#### IV. REGIONAL VARIATION IN MILK COMPONENT LEVELS

Between geographic regions, differences in climate, breeds of cattle, common management practices, feeds, and other characteristics of dairy operations can reveal varying milk component levels on a geographic basis. The data was divided into ten regions based on the geographic location of the dairy farms. The ten regions are primarily based on a combination of relatively homogeneous climates and state and Federal order borders. Producer milk was aggregated based on the location it was produced, not by what order it was pooled on.

Regions 1 through 6 are associated with the Pacific Northwest region and are defined in Appendix Map A-2. Table 7, on the following page, provides 2002 milk production, average number of producers, and component tests for each region. In 2002, the region with the most milk associated with the Pacific Northwest Order was Region 1 followed by Regions 2, 5, 6, 3, and 4. Component levels for each region appear to vary only slightly.

The Western region is represented by Regions 7, 8, and 9. Region 8 represented the greatest portion of milk pooled on the Western Order, followed by Region 9. Region 10 represents the Arizona-Las Vegas Order and southern California producers pooled on the Pacific Northwest and Western Orders.

---

<sup>2</sup> By definition, for a *normal distribution*, approximately 68% of observations are within one standard deviation of the mean.

<b>Table 7</b>			
<b>Various Statistics by Region For 2002</b>			
<b>Region 1 (Western Washington)</b>		<b>Region 2 (Central Washington)</b>	
Milk Production	2,986,950,439	Milk Production	1,983,898,171
Average Number of Producers	461	Average Number of Producers	105
Average Pounds Per Producer	6,483,973	Average Pounds Per Producer	18,984,671
Butterfat Test	3.66%	Butterfat Test	3.58%
Protein Test	3.03%	Protein Test	2.99%
Other Solids Test	5.69%	Other Solids Test	5.70%
<b>Region 3 (Eastern Washington)</b>		<b>Region 4 (Northern Idaho)</b>	
Milk Production	413,300,996	Milk Production	19,641,969
Average Number of Producers	56	Average Number of Producers	14
Average Pounds Per Producer	7,413,471	Average Pounds Per Producer	1,411,399
Butterfat Test	3.58%	Butterfat Test	3.81%
Protein Test	3.02%	Protein Test	3.07%
Other Solids Test	5.71%	Other Solids Test	5.67%
<b>Region 5 (Western Oregon)</b>		<b>Region 6 (Central Oregon)</b>	
Milk Production	1,499,803,059	Milk Production	471,397,959
Average Number of Producers	280	Average Number of Producers	21
Average Pounds Per Producer	5,358,034	Average Pounds Per Producer	22,270,770
Butterfat Test	3.82%	Butterfat Test	3.91%
Protein Test	3.11%	Protein Test	3.18%
Other Solids Test	5.73%	Other Solids Test	5.78%
<b>Region 7 (Eastern Oregon)</b>		<b>Region 8 (Southern Idaho)</b>	
Milk Production	44,907,970	Milk Production	3,215,323,264
Average Number of Producers	27	Average Number of Producers	409
Average Pounds Per Producer	1,637,981	Average Pounds Per Producer	7,856,624
Butterfat Test	3.71%	Butterfat Test	3.63%
Protein Test	3.09%	Protein Test	3.06%
Other Solids Test	5.66%	Other Solids Test	5.73%
<b>Region 9 (Greater Utah)</b>		<b>Region 10 (Arizona)</b>	
Milk Production	1,563,049,586	Milk Production	4,194,154,811
Average Number of Producers	387	Average Number of Producers	170
Average Pounds Per Producer	4,038,018	Average Pounds Per Producer	24,623,218
Butterfat Test	3.63%	Butterfat Test	3.62%
Protein Test	3.05%	Protein Test	n/a
Other Solids Test	5.73%	Other Solids Test	n/a

n/a = not applicable

In general, comparing all the regions, Region 10 had the most milk pooled in 2002, with 4.2 billion pounds, while Region 1 had the most producers (461 producers on average). Average milk production per producer was the highest in Region 10 with an average of 24.6 million pounds per producer for the year. The highest butterfat levels in 2002 were in Region 6 with annual tests of 3.91%, while Region 2 and 3 had the lowest annual butterfat test of 3.58%. Protein levels in Region 6 (3.18%) and other solids levels in Region 6 (5.78%) were the highest for each of those components.

Producer milk, number of producers, and average milk production per producer varied greatly between regions. Small differences in component levels were also evident. In 2002, butterfat levels in Regions 4, 5, and 6 were noticeably higher than the other regions, while Regions 2 and 3 were much lower than the other regions. Protein levels in Region 6 were 0.19% higher than Region 2. Other solids levels by region varied only 0.12% between the high and low for the year 2002.

## V. STATISTICAL RELATIONSHIP AMONG MILK COMPONENTS

Regression analysis was used to analyze the linear relationship between milk component levels. The analysis revealed that the only significant relationship between components was between butterfat (BF) and protein (PRO). Regressions of nonfat solids and protein and nonfat solids and butterfat were found to be insignificant and not included in this study. This latter finding was expected and is due to: (1) nonfat solids, by definition, is protein plus other solids; and (2) other solids levels appear random and show little seasonal variation. (See Appendix Figures A-10 and A-11.)

The Pacific Northwest Order had 12,321 observations in 2002, compared to the Western Order's 9,541 observations. The linear regression for protein and butterfat for 2002 varied between the Pacific Northwest and Western Orders. The regression equation calculated for each order was:

$$\begin{array}{ll} \text{Pacific Northwest:} & \text{PRO\%} = 1.4879 + 0.4263 \text{ BF\%} \\ & R^2 = 0.6486 \end{array}$$

$$\begin{array}{ll} \text{Western:} & \text{PRO\%} = 1.5916 + 0.4147 \text{ BF\%} \\ & R^2 = 0.4933 \end{array}$$

The correlation ( $R^2$ ) between protein and butterfat is slightly higher in the Pacific Northwest Order compared to the Western Order. The Pacific Northwest's slope is slightly steeper, but the intercept is slightly less. Adjusting for the difference in protein testing in years previous to 2000, both equations above are similar to previous Federal order publications<sup>3</sup>. Appendix Figures A-8 and A-9 show graphical representations of the linear regressions for May and November 2002.

The butterfat and protein regression equations for the Pacific Northwest and Western Orders (Southwestern Idaho-Eastern Oregon prior to January 2000), on a combined basis, were done for 1997, 1998, 1999, 2000, 2001, and 2002. (See Table 8 on page 10.) The Pacific Northwest Order did not price milk based on protein in January 1997; no data was available for this month. Over the 1997 - 1999 periods, the general trend of the regression is toward a lower intercept but a steeper slope. This would suggest that, in general, a change in the butterfat level is associated with a larger change in the protein level in 1999 compared to 1997 or 1998. Beginning January 2000, the use of true protein, instead of crude protein, lowered the intercept and changed the slope only slightly. The changes in order marketing areas that occurred because of order

---

<sup>3</sup> See *Analysis of Component Levels and Somatic Cell Count in Individual Herd Milk at the Farm Level, 1998*, Upper Midwest Marketing Area, Staff paper 99-01, July 1999.

consolidation, implemented January 2000, changed dramatically what milk was included for analysis for Federal Order 135 (now known as the Western Order but previously known as the Southwestern Idaho-Eastern Oregon and Great Basin Orders). Diversion limits and institutional factors reduced the percentage of milk pooled from Southern Idaho, while the inclusion of California and Colorado milk on the Western Order added a new source of milk to this study. The expected effect from changing protein testing methods is to lower the protein levels by about 0.19 percentage points, similar to what is seen in Table 8.

---

**Table 8**  
**Pacific Northwest and Western Federal Orders\***  
**Comparison of Regression Results: Butterfat Level as a Predictor of Protein Levels**  
**1997 through 2002**

<u>Year</u>	<u>Equation</u>	<u>Correlation</u>
1997	CRUDE PRO% = 1.917 + 0.360 BF%	R <sup>2</sup> = 0.512
1998	CRUDE PRO% = 1.810 + 0.390 BF%	R <sup>2</sup> = 0.538
1999	CRUDE PRO% = 1.809 + 0.395 BF%	R <sup>2</sup> = 0.561
2000	TRUE PRO% = 1.632 + 0.390 BF%	R <sup>2</sup> = 0.533
2001	TRUE PRO% = 1.615 + 0.400 BF%	R <sup>2</sup> = 0.534
2002	TRUE PRO% = 1.575 + 0.410 BF%	R <sup>2</sup> = 0.560

\* 1997 - 1999, Pacific Northwest and Southwestern Idaho-Eastern Oregon Federal Orders.

---

## VI. MINIMUM ORDER VALUE OF MILK PRODUCTION

The use of multiple component pricing allows the evaluation of the minimum order value of milk components in a hundredweight of milk.

The minimum order value of producer milk at test pooled on the Pacific Northwest Order in 2002 averaged \$11.56 per hundredweight. The value of each component comprising the \$11.56 per hundredweight was: \$4.38 for butterfat; \$6.01 for protein; \$0.34 for other solids; and a producer price differential of \$0.83.<sup>4</sup>

The value of producers' milk at test pooled on the Western Order in 2002 averaged \$11.40 per hundredweight. The value of each component comprising the \$11.40 per hundredweight was: \$4.32 for butterfat; \$6.07 for protein; \$0.34 for other solids; and a producer price differential of \$0.67.<sup>4</sup>

---

<sup>4</sup> The producer price differentials for the Pacific Northwest and Western Orders are subject to applicable location adjustments. The effects of the location adjustments are not dealt with in this study.

The value of producers' milk pooled on the Arizona-Las Vegas Order in 2002 averaged \$11.69 per hundredweight. The value of skim and butterfat portions of the \$11.69 per hundredweight was: \$4.39 for butterfat; and \$7.30 for skim.<sup>5</sup>

There is an apparent inverse relationship between the size-range of producers' production and the butterfat and protein levels in their milk. An inverse relationship between size-range and certain component levels may be due to the relative prevalence of high component testing breeds among smaller herd sizes (e.g. Jerseys) compared to lower component testing breeds (e.g. Holsteins). The weighted average component levels by size-range of milk production is summarized in Appendix Table A-7 and Figure A-12. On the Pacific Northwest and Western Orders the inverse relationship between size-range and producer butterfat and protein levels is more apparent than the levels of butterfat on the Arizona-Las Vegas Order. On the Pacific Northwest and Western Orders, there appears to be a positive relationship between the size-range of a producers' production and the other solids levels in their milk. The difference in component levels, in turn, translates to an inverse relationship between size-range and minimum order value per hundredweight.

The aggregated value of milk production by size-range of milk production is summarized in Appendix Table A-8 and Figure A-13. For the Pacific Northwest Order, on average, using 2002 Federal order prices, producers with less than 50,000 pounds of production received more per hundredweight, \$12.49, than other producers. Producers with more than one million pounds of production averaged the lowest amount per hundredweight, at \$11.43. Producers on the Western Order followed a similar pattern as producers on the Pacific Northwest Order. Producers with less than 50,000 pounds of production pooled on the Western Order received more per hundredweight, \$11.92, than other producers. Producers with between 500,000 and 600,000 pounds of production averaged the lowest amount per hundredweight, at \$11.30. This relationship is generally indicative of the fact that smaller herds typically have higher component levels than larger herds. On the Arizona-Las Vegas Order, using skim-butterfat values, a relationship between size-range and value per hundredweight was less evident. The Arizona-Las Vegas Order data was broken down further for producers over one million pounds into smaller increments (e.g. 1-2 million pounds, 2-3 million pounds, 3-4 million pounds, etc.) to determine whether the size-range categories used masked any relationships. Using smaller increments does indicate producers pooled on the Arizona-Las Vegas Order who have more milk deliveries have a lower value of milk; the relationship, however, is not as significant as the other two orders noted above.

## VII. SUMMARY

This paper analyzes milk components associated with the Pacific Northwest, Arizona-Las Vegas, and Western Orders. Handlers regulated under the Pacific Northwest and Western Orders report butterfat, protein, and other solids. Handlers regulated under the Arizona-Las Vegas Order report butterfat, only. For each order, producer information was collected from handler payrolls submitted to the market administrator's office. Component levels were examined using a variety

---

<sup>5</sup> The producer prices for the Arizona-Las Vegas Order are subject to applicable location adjustments. The effects of the location adjustment are not dealt with in this study.



of measures including: annual averages, seasonal and regional averages, relationships between components, frequency distributions and scatter plots of regressions, and the value of milk components by size-range of production.

Weighted average component levels for the Pacific Northwest Order in 2002 were: 3.68% butterfat, 3.05% protein, and 5.71% other solids. Butterfat and protein percentages peaked in November and reached a low in July, respectively. Other solids demonstrated very little seasonal change.

Although the volume of producer milk, number of producers, and average milk production per producer varies greatly between regions, there are only small differences in aggregate component levels between geographic regions within the milk shed of the three orders.

The linear relationship between butterfat and protein on the Pacific Northwest Order was:

$$\text{Protein} = 1.4879 + 0.4263 * \text{Butterfat} \quad (R^2 = 0.6486).$$

In 2002, the Federal order weighted average price received for milk was \$11.56 per hundredweight, at test.

Weighted average component levels for the Western Order in 2002 were: 3.63% butterfat, 3.06% protein, and 5.72% other solids. Butterfat and protein percentages peaked in November and reached a low in July. Other solids, as in the Pacific Northwest Order, had very little seasonal change.

The linear relationship between butterfat and protein on the Western Order was:

$$\text{Protein} = 1.5916 + 0.4147 * \text{Butterfat} \quad (R^2 = 0.4933).$$

In 2002, the Federal order weighted average price received for milk was \$11.40 per hundredweight, at test.

The annual average butterfat level for the Arizona-Las Vegas Order in 2002 was 3.63%. Butterfat levels peaked in January and reached a low April and May. In 2002, the Federal order weighted average price received for milk was \$11.69 per hundredweight, at test.

In 2002, the minimum order value of producer milk at test pooled on the Pacific Northwest Order averaged \$11.56, the Western Order averaged \$11.40, and the Arizona-Las Vegas Order averaged \$11.69. In general, as producers monthly deliveries increase, the weighted average value of the milk, at Federal order prices, decreases.

# **APPENDIX**

**Table A-1**

**STATISTICAL DATA FOR PRODUCERS ON THE  
PACIFIC NORTHWEST ORDER INCLUDED IN COMPONENT ANALYSIS**

**2002**

**Butterfat**

<u>Month</u>	<u>Weighted Average</u> - % -	<u>Mean</u> - % -	<u>Standard Deviation</u> - % -	<u>Median</u> - % -	<u>Minimum</u> - % -	<u>Maximum</u> - % -	<u>Number of Observations</u>
January	3.72	3.85	0.35	3.76	2.89	5.33	1,170
February	3.72	3.82	0.35	3.74	2.66	5.28	1,035
March	3.72	3.82	0.34	3.74	2.62	5.44	1,157
April	3.67	3.76	0.34	3.69	2.64	5.04	1,164
May	3.61	3.69	0.34	3.62	2.58	4.93	972
June	3.58	3.65	0.34	3.58	2.77	4.95	974
July	3.57	3.64	0.33	3.57	2.76	4.92	968
August	3.60	3.69	0.34	3.62	2.38	5.17	980
September	3.67	3.77	0.35	3.69	2.44	5.38	977
October	3.75	3.86	0.37	3.78	2.80	5.74	983
November	3.79	3.91	0.38	3.82	2.76	6.11	970
December	3.74	3.87	0.37	3.78	2.61	5.93	971
For the Year	3.68	3.78	0.36	3.70	2.38	6.11	12,321

**Protein**

<u>Month</u>	<u>Weighted Average</u> - % -	<u>Mean</u> - % -	<u>Standard Deviation</u> - % -	<u>Median</u> - % -	<u>Minimum</u> - % -	<u>Maximum</u> - % -	<u>Number of Observations</u>
January	3.07	3.14	0.20	3.09	2.68	4.02	1,170
February	3.06	3.10	0.18	3.06	2.60	3.83	1,035
March	3.06	3.12	0.18	3.08	2.73	3.90	1,157
April	3.03	3.09	0.18	3.05	2.54	3.79	1,164
May	3.00	3.06	0.19	3.01	2.64	3.85	972
June	2.98	3.03	0.18	2.99	2.68	3.71	974
July	2.97	3.02	0.18	2.98	2.61	3.73	968
August	3.01	3.05	0.18	3.01	2.51	3.75	980
September	3.06	3.11	0.18	3.07	2.68	3.91	977
October	3.12	3.17	0.19	3.13	2.65	4.09	983
November	3.13	3.17	0.20	3.13	2.69	4.31	970
December	3.08	3.13	0.19	3.08	2.71	4.09	971
For the Year	3.05	3.10	0.19	3.06	2.51	4.31	12,321

Table A-1 (Continued)

STATISTICAL DATA FOR PRODUCERS ON THE  
PACIFIC NORTHWEST ORDER INCLUDED IN COMPONENT ANALYSIS

2002

<u>Month</u>	<b>Other Solids</b>						<u>Number of Observations</u>
	<u>Weighted Average</u>	<u>Mean</u>	<u>Standard Deviation</u>	<u>Median</u>	<u>Minimum</u>	<u>Maximum</u>	
	- % -	- % -	- % -	- % -	- % -	- % -	
January	5.70	5.67	0.09	5.69	4.61	5.96	1,170
February	5.71	5.69	0.08	5.69	5.26	5.99	1,035
March	5.71	5.70	0.07	5.70	5.21	5.95	1,157
April	5.74	5.71	0.08	5.73	5.23	5.99	1,164
May	5.74	5.72	0.08	5.73	5.16	6.04	972
June	5.73	5.70	0.08	5.71	5.31	6.03	974
July	5.71	5.68	0.09	5.69	5.09	6.00	968
August	5.70	5.68	0.09	5.68	4.91	5.97	980
September	5.68	5.65	0.09	5.65	5.06	5.91	977
October	5.68	5.64	0.10	5.65	5.12	5.88	983
November	5.68	5.65	0.10	5.66	5.12	5.87	970
December	5.69	5.66	0.10	5.67	4.94	5.87	971
For the Year	5.71	5.68	0.09	5.69	4.61	6.04	12,321

**Table A-2**

**STATISTICAL DATA FOR PRODUCERS ON THE  
WESTERN ORDER INCLUDED IN COMPONENT ANALYSIS**

**2002**

**Butterfat**

<u>Month</u>	<u>Weighted Average</u> - % -	<u>Mean</u> - % -	<u>Standard Deviation</u> - % -	<u>Median</u> - % -	<u>Minimum</u> - % -	<u>Maximum</u> - % -	<u>Number of Observations</u>
January	3.74	3.81	0.30	3.76	3.20	5.49	780
February	3.73	3.79	0.29	3.73	3.06	5.32	767
March	3.68	3.74	0.31	3.69	2.99	5.55	738
April	3.61	3.65	0.28	3.61	2.69	4.90	786
May	3.55	3.58	0.26	3.56	2.94	4.72	791
June	3.50	3.52	0.26	3.49	2.70	4.78	801
July	3.48	3.49	0.25	3.47	2.84	4.76	797
August	3.51	3.55	0.27	3.52	2.80	4.73	796
September	3.61	3.67	0.28	3.64	2.91	5.17	798
October	3.70	3.78	0.30	3.75	2.97	5.34	795
November	3.76	3.83	0.31	3.78	2.87	5.15	853
December	3.74	3.81	0.34	3.76	3.00	5.20	839
For the Year	3.63	3.69	0.31	3.65	2.69	5.55	9,541

**Protein**

<u>Month</u>	<u>Weighted Average</u> - % -	<u>Mean</u> - % -	<u>Standard Deviation</u> - % -	<u>Median</u> - % -	<u>Minimum</u> - % -	<u>Maximum</u> - % -	<u>Number of Observations</u>
January	3.12	3.19	0.18	3.15	2.81	4.02	780
February	3.10	3.17	0.18	3.13	2.78	4.01	767
March	3.07	3.13	0.17	3.10	2.78	3.93	738
April	3.04	3.08	0.16	3.06	2.66	3.79	786
May	3.02	3.05	0.15	3.04	2.64	3.77	791
June	2.98	3.03	0.16	3.00	2.64	3.85	801
July	2.96	3.00	0.16	2.98	2.58	3.85	797
August	3.02	3.05	0.16	3.03	2.66	3.84	796
September	3.06	3.12	0.16	3.08	2.79	3.87	798
October	3.14	3.20	0.18	3.17	2.79	4.07	795
November	3.16	3.22	0.18	3.19	2.75	4.14	853
December	3.13	3.19	0.19	3.15	2.63	4.13	839
For the Year	3.06	3.12	0.18	3.09	2.58	4.14	9,541

Table A-2 (Continued)

STATISTICAL DATA FOR PRODUCERS ON THE  
WESTERN ORDER INCLUDED IN COMPONENT ANALYSIS

2002

<u>Month</u>	<b>Other Solids</b>						<u>Number of Observations</u>
	<u>Weighted Average</u>	<u>Mean</u>	<u>Standard Deviation</u>	<u>Median</u>	<u>Minimum</u>	<u>Maximum</u>	
	- % -	- % -	- % -	- % -	- % -	- % -	
January	5.71	5.67	0.10	5.69	5.07	5.91	780
February	5.72	5.69	0.10	5.71	4.86	5.92	767
March	5.72	5.70	0.10	5.71	4.76	5.93	738
April	5.74	5.71	0.11	5.72	4.65	5.92	786
May	5.74	5.72	0.09	5.73	4.64	5.94	791
June	5.74	5.73	0.09	5.74	5.05	5.99	801
July	5.75	5.73	0.09	5.74	5.03	5.97	797
August	5.73	5.70	0.11	5.72	5.07	6.39	796
September	5.70	5.67	0.10	5.68	5.09	5.89	798
October	5.68	5.64	0.11	5.66	4.70	5.87	795
November	5.69	5.65	0.13	5.67	4.95	5.87	853
December	5.70	5.67	0.12	5.69	4.81	5.92	839
For the Year	5.72	5.69	0.11	5.70	4.64	6.39	9,541

**Table A-3**

**STATISTICAL DATA FOR PRODUCERS ON THE  
ARIZONA-LAS VEGAS ORDER INCLUDED IN COMPONENT ANALYSIS**

**2002**

<u>Month</u>	<b>Butterfat</b>						<u>Number of Observations</u>
	<u>Weighted Average</u>	<u>Mean</u>	<u>Standard Deviation</u>	<u>Median</u>	<u>Minimum</u>	<u>Maximum</u>	
	- % -	- % -	- % -	- % -	- % -	- % -	
January	3.73	3.77	0.27	3.73	3.29	4.91	110
February	3.66	3.69	0.28	3.67	3.24	4.92	109
March	3.59	3.61	0.27	3.58	3.16	4.78	108
April	3.56	3.57	0.26	3.55	3.12	4.67	111
May	3.56	3.58	0.26	3.55	3.09	4.69	108
June	3.59	3.61	0.25	3.57	3.10	4.81	109
July	3.59	3.61	0.26	3.56	3.05	4.70	108
August	3.59	3.61	0.27	3.57	3.00	4.71	105
September	3.64	3.67	0.26	3.64	2.99	4.76	107
October	3.66	3.69	0.25	3.65	3.11	4.72	109
November	3.70	3.73	0.28	3.68	3.12	4.87	107
December	3.70	3.73	0.29	3.69	3.18	4.84	107
For the Year	3.63	3.65	0.27	3.62	2.99	4.92	1,298

**Table A-4**

**WEIGHTED AVERAGE COMPONENT LEVELS BY REGION  
2002**

**Butterfat**

	<u>Region 1</u>	<u>No.*</u>	<u>Region 2</u>	<u>No.*</u>	<u>Region 3</u>	<u>No.*</u>	<u>Region 4</u>	<u>No.*</u>	<u>Region 5</u>	<u>No.*</u>
	-% -		-% -		-% -		-% -		-% -	
January	3.69	470	3.64	102	3.64	56	3.89	14	3.85	278
February	3.71	470	3.63	102	3.65	56	3.86	14	3.85	278
March	3.70	465	3.62	103	3.62	56	3.82	14	3.84	280
April	3.66	466	3.55	102	3.58	56	3.79	14	3.83	281
May	3.61	464	3.50	103	3.51	56	3.73	14	3.76	282
June	3.56	461	3.46	105	3.48	57	3.67	14	3.72	282
July	3.56	461	3.47	105	3.49	56	3.62	14	3.71	280
August	3.59	457	3.49	106	3.51	56	3.68	14	3.76	281
September	3.65	457	3.56	106	3.56	56	3.84	14	3.82	281
October	3.72	456	3.67	107	3.67	55	3.97	14	3.90	282
November	3.73	451	3.73	106	3.71	55	4.00	14	3.92	280
December	3.70	450	3.68	107	3.63	54	3.92	13	3.87	274
For the Year	3.66	5,528	3.58	1,254	3.58	669	3.81	167	3.82	3,359

	<u>Region 6</u>	<u>No.*</u>	<u>Region 7</u>	<u>No.*</u>	<u>Region 8</u>	<u>No.*</u>	<u>Region 9</u>	<u>No.*</u>	<u>Region 10</u>	<u>No.*</u>
	-% -		-% -		-% -		-% -		-% -	
January	3.95	20	3.87	27	3.72	497	3.76	443	3.75	153
February	3.95	21	3.80	22	3.71	361	3.69	435	3.69	152
March	3.91	21	3.63	20	3.69	459	3.68	434	3.61	151
April	3.85	21	3.73	30	3.61	479	3.59	450	3.57	162
May	3.81	21	3.57	29	3.54	390	3.54	345	3.56	167
June	3.81	21	3.57	29	3.50	393	3.50	348	3.57	174
July	3.79	21	3.50	29	3.50	389	3.46	344	3.55	174
August	3.83	22	3.55	29	3.52	390	3.51	348	3.56	178
September	3.90	22	3.72	29	3.62	393	3.61	342	3.61	182
October	4.00	22	3.86	29	3.72	392	3.71	346	3.64	184
November	4.13	21	3.93	28	3.77	384	3.76	409	3.70	182
December	4.08	21	3.92	28	3.72	384	3.74	401	3.71	185
For the Year	3.91	254	3.71	329	3.63	4,911	3.63	4,645	3.62	2,044



**Table A-4 (Continued)**

**WEIGHTED AVERAGE COMPONENT LEVELS BY REGION  
2002**

**Protein**

	<u>Region 1</u>	<u>No.*</u>	<u>Region 2</u>	<u>No.*</u>	<u>Region 3</u>	<u>No.*</u>	<u>Region 4</u>	<u>No.*</u>	<u>Region 5</u>	<u>No.*</u>
	-% -		-% -		-% -		-% -		-% -	
January	3.05	470	3.04	102	3.07	56	3.11	14	3.12	278
February	3.04	470	3.02	102	3.06	56	3.09	14	3.11	278
March	3.04	465	3.02	103	3.04	56	3.07	14	3.11	280
April	3.02	466	2.98	102	3.00	56	3.05	14	3.10	281
May	2.99	464	2.93	103	2.93	56	3.00	14	3.10	282
June	2.96	461	2.90	105	2.90	57	2.99	14	3.07	282
July	2.98	461	2.88	105	2.89	56	2.98	14	3.06	280
August	3.01	457	2.94	106	2.96	56	3.04	14	3.08	281
September	3.06	457	3.00	106	3.03	56	3.11	14	3.13	281
October	3.11	456	3.08	107	3.13	55	3.17	14	3.18	282
November	3.11	451	3.09	106	3.15	55	3.16	14	3.17	280
December	3.06	450	3.03	107	3.08	54	3.13	13	3.13	274
For the Year	3.03	5,528	2.99	1,254	3.02	669	3.07	167	3.11	3,359
	<u>Region 6</u>	<u>No.*</u>	<u>Region 7</u>	<u>No.*</u>	<u>Region 8</u>	<u>No.*</u>	<u>Region 9</u>	<u>No.*</u>	<u>Region 10</u>	<u>No.*</u>
	-% -		-% -		-% -		-% -		-% -	
January	3.14	20	3.18	27	3.11	497	3.13	443	N/A	N/A
February	3.16	21	3.17	22	3.10	361	3.10	435	N/A	N/A
March	3.18	21	3.08	20	3.08	459	3.06	434	N/A	N/A
April	3.16	21	3.08	30	3.05	479	3.02	450	N/A	N/A
May	3.17	21	3.04	29	3.01	390	3.00	345	N/A	N/A
June	3.14	21	3.01	29	2.97	393	2.97	348	N/A	N/A
July	3.12	21	2.94	29	2.95	389	2.95	344	N/A	N/A
August	3.15	22	2.99	29	3.01	390	3.00	348	N/A	N/A
September	3.17	22	3.09	29	3.06	393	3.05	342	N/A	N/A
October	3.25	22	3.20	29	3.14	392	3.12	346	N/A	N/A
November	3.28	21	3.21	28	3.16	384	3.14	409	N/A	N/A
December	3.25	21	3.18	28	3.12	384	3.10	401	N/A	N/A
For the Year	3.18	254	3.09	329	3.06	4,911	3.05	4,645	N/A	N/A

**Table A-4 (Continued)**

**WEIGHTED AVERAGE COMPONENT LEVELS BY REGION  
2002**

**Other Solids**

	<u>Region 1</u>	<u>No.*</u>	<u>Region 2</u>	<u>No.*</u>	<u>Region 3</u>	<u>No.*</u>	<u>Region 4</u>	<u>No.*</u>	<u>Region 5</u>	<u>No.*</u>
	-% -		-% -		-% -		-% -		-% -	
January	5.69	470	5.70	102	5.71	56	5.67	14	5.71	278
February	5.69	470	5.70	102	5.71	56	5.68	14	5.72	278
March	5.70	465	5.70	103	5.71	56	5.68	14	5.73	280
April	5.72	466	5.74	102	5.75	56	5.70	14	5.76	281
May	5.73	464	5.75	103	5.76	56	5.73	14	5.75	282
June	5.70	461	5.73	105	5.74	57	5.70	14	5.75	282
July	5.69	461	5.71	105	5.72	56	5.68	14	5.74	280
August	5.68	457	5.71	106	5.72	56	5.66	14	5.72	281
September	5.66	457	5.68	106	5.68	56	5.61	14	5.72	281
October	5.65	456	5.67	107	5.68	55	5.61	14	5.71	282
November	5.66	451	5.67	106	5.69	55	5.63	14	5.71	280
December	5.67	450	5.67	107	5.69	54	5.64	13	5.72	274
For the Year	5.69	5,528	5.70	1,254	5.71	669	5.67	167	5.73	3,359
	<u>Region 6</u>	<u>No.*</u>	<u>Region 7</u>	<u>No.*</u>	<u>Region 8</u>	<u>No.*</u>	<u>Region 9</u>	<u>No.*</u>	<u>Region 10</u>	<u>No.*</u>
	-% -		-% -		-% -		-% -		-% -	
January	5.77	20	5.65	27	5.72	497	5.70	443	N/A	N/A
February	5.80	21	5.67	22	5.73	361	5.73	435	N/A	N/A
March	5.76	21	5.70	20	5.74	459	5.73	434	N/A	N/A
April	5.82	21	5.66	30	5.75	479	5.74	450	N/A	N/A
May	5.81	21	5.72	29	5.76	390	5.73	345	N/A	N/A
June	5.81	21	5.71	29	5.75	393	5.75	348	N/A	N/A
July	5.80	21	5.70	29	5.76	389	5.76	344	N/A	N/A
August	5.74	22	5.63	29	5.74	390	5.75	348	N/A	N/A
September	5.75	22	5.60	29	5.71	393	5.71	342	N/A	N/A
October	5.74	22	5.58	29	5.70	392	5.69	346	N/A	N/A
November	5.80	21	5.60	28	5.71	384	5.70	409	N/A	N/A
December	5.80	21	5.63	28	5.71	384	5.72	401	N/A	N/A
For the Year	5.78	254	5.66	329	5.73	4,911	5.73	4,645	N/A	N/A

\* Number of producers included in monthly average component level.

N/A = not applicable, Arizona-Las Vegas Order, Area 10, did not use protein and other solids.

**Table A-5**

**LINEAR RELATIONSHIPS BETWEEN VARIOUS MILK COMPONENTS  
2002**

**Butterfat Levels as a Predictor of Protein  
Protein = c + b (Butterfat)**

**Pacific Northwest Order**

	<u>c</u> <u>Constant</u>	<u>b</u> <u>Butterfat</u> <u>Coefficient</u>	<u>Standard</u> <u>Error of b</u>	<u>R-Squared</u> <u>(Adjusted)</u>	<u>Standard</u> <u>Error</u>	<u>Number of</u> <u>Comparisons</u>
January	1.46570	0.43494	0.01013	0.61193	0.12173	1,170
February	1.55038	0.40523	0.00990	0.61836	0.11157	1,035
March	1.57373	0.40373	0.00996	0.58681	0.11606	1,157
April	1.58468	0.39900	0.00978	0.58856	0.11474	1,164
May	1.43225	0.44092	0.01100	0.62303	0.11787	972
June	1.44585	0.43271	0.00994	0.66074	0.10494	974
July	1.38598	0.44933	0.01002	0.67503	0.10326	968
August	1.50600	0.42010	0.00996	0.64473	0.10585	980
September	1.55223	0.41280	0.00983	0.64348	0.10874	977
October	1.56543	0.41504	0.00935	0.66708	0.10971	983
November	1.53730	0.41854	0.00986	0.64998	0.11800	970
December	1.51319	0.41747	0.00987	0.64822	0.11464	971
For the Year	1.48792	0.42632	0.00283	0.64860	0.11373	12,321

**Western Order**

	<u>c</u> <u>Constant</u>	<u>b</u> <u>Butterfat</u> <u>Coefficient</u>	<u>Standard</u> <u>Error of b</u>	<u>R-Squared</u> <u>(Adjusted)</u>	<u>Standard</u> <u>Error</u>	<u>Number of</u> <u>Comparisons</u>
January	1.46705	0.45102	0.01439	0.55739	0.11922	780
February	1.49711	0.44103	0.01524	0.52215	0.12195	767
March	1.69562	0.38399	0.01481	0.47661	0.12285	738
April	1.72860	0.37057	0.01486	0.44174	0.11617	786
May	1.68578	0.38189	0.01607	0.41629	0.11792	791
June	1.71330	0.37287	0.01687	0.37871	0.12370	801
July	1.77125	0.35244	0.01834	0.31636	0.13152	797
August	1.82217	0.34687	0.01636	0.36063	0.12451	796
September	1.76323	0.36859	0.01578	0.40582	0.12547	798
October	1.67184	0.40504	0.01646	0.43230	0.13867	795
November	1.72414	0.39145	0.01531	0.43387	0.13879	853
December	1.89689	0.33884	0.01516	0.37304	0.14821	839
For the Year	1.59155	0.41466	0.00430	0.49333	0.13106	9,541

Table A-6

**MONTHLY PRODUCER COMPONENT PRICES  
2002**

<u>Month</u>	<b>Pacific Northwest and Western Order</b>			<b>Pacific Northwest Order</b>	<b>Western Order</b>
	Butterfat	Protein	Other Solids	Producer Price	Producer Price
	<u>Price</u> \$/ pound	<u>Price</u> \$/ pound	<u>Price</u> \$/ pound	<u>Differential 1/</u> \$/ hundredweight	<u>Differential 1/</u> \$/ hundredweight
January	1.4846	1.9660	0.1392	0.66	0.57
February	1.3817	2.0884	0.0965	0.51	0.46
March	1.3638	1.8342	0.0688	1.08	0.91
April	1.2890	2.0109	0.0566	0.79	0.69
May	1.1433	2.2097	0.0371	0.53	0.49
June	1.1211	2.0148	0.0247	0.91	0.78
July	1.0929	1.8095	0.0150	1.33	0.93
August	1.0701	1.9021	0.0177	1.12	0.81
September	1.0099	2.0646	0.0367	0.74	0.63
October	1.0726	2.1839	0.0755	0.22	0.29
November	1.0923	1.8469	0.0850	1.00	0.81
December	1.1922	1.7506	0.0584	1.07	0.76
<b>Simple Average</b>	<b>1.1928</b>	<b>1.9735</b>	<b>0.0593</b>	<b>0.83</b>	<b>0.68</b>

1/ The producer price differentials for the Pacific Northwest and Western Orders are subject to applicable location adjustments. The effects of the location adjustments are not dealt with in this study.

<u>Month</u>	<b>Arizona-Las Vegas Order</b>	
	Skim <u>Price 2/</u> \$/ hundredweight	Butterfat <u>Price 2/</u> \$/ pound
January	7.93	1.4742
February	7.82	1.4030
March	7.38	1.3683
April	7.48	1.3071
May	7.64	1.1807
June	7.52	1.1326
July	7.24	1.1085
August	7.51	1.0828
September	7.70	1.0296
October	7.94	1.0626
November	7.60	1.0884
December	7.20	1.1767
<b>Simple Average</b>	<b>7.58</b>	<b>1.2012</b>

2/ The producer prices for the Arizona-Las Vegas Order are subject to applicable location adjustments. The effects of the location adjustments are not dealt with in this study.

**Table A-7**

**AGGREGATED COMPONENT TESTS BY SIZE RANGE  
PRODUCER MILK DELIVERIES  
2002**

**Pacific Northwest Order**

<u>Size Range</u>		<u>Butterfat</u>	<u>Protein</u>	<u>Other Solids</u>
<u>Equal to or more than</u> - pounds -	<u>Less than</u> - pounds -			
	50,000	3.96	3.21	5.63
50,000	100,000	3.87	3.16	5.64
100,000	200,000	3.87	3.14	5.66
200,000	300,000	3.80	3.10	5.67
300,000	400,000	3.79	3.10	5.69
400,000	500,000	3.78	3.09	5.69
500,000	600,000	3.75	3.08	5.70
600,000	700,000	3.68	3.05	5.71
700,000	1,000,000	3.65	3.04	5.71
1,000,000	3,000,000	3.62	3.02	5.71
3,000,000		3.64	3.02	5.72
Weighted Average		3.68	3.05	5.71

**Western Order**

<u>Size Range</u>		<u>Butterfat</u>	<u>Protein</u>	<u>Other Solids</u>
<u>Equal to or more than</u> - pounds -	<u>Less than</u> - pounds -			
	50,000	3.78	3.19	5.63
50,000	100,000	3.74	3.19	5.66
100,000	200,000	3.69	3.15	5.70
200,000	300,000	3.65	3.10	5.71
300,000	400,000	3.67	3.08	5.72
400,000	500,000	3.69	3.07	5.70
500,000	600,000	3.60	3.05	5.71
600,000	700,000	3.60	3.03	5.71
700,000	1,000,000	3.62	3.07	5.72
1,000,000	3,000,000	3.61	3.05	5.72
3,000,000		3.64	3.04	5.72
Weighted Average		3.63	3.06	5.72

**Table A-7 (Continued)**

**AGGREGATED COMPONENT TESTS BY SIZE RANGE  
PRODUCER MILK DELIVERIES  
2002**

**Arizona-Las Vegas Order**

<u>Size Range</u>		<u>Butterfat</u>
<u>Equal to or more than</u>	<u>Less than</u>	
- pounds -	- pounds -	- % -
	100,000	3.70
100,000	200,000	3.88
200,000	300,000	3.65
300,000	400,000	3.55
400,000	500,000	3.49
500,000	600,000	3.62
600,000	700,000	3.64
700,000	1,000,000	3.61
1,000,000	2,000,000	3.74
2,000,000	3,000,000	3.68
3,000,000	4,000,000	3.61
4,000,000	5,000,000	3.62
5,000,000	6,000,000	3.55
6,000,000	7,000,000	3.56
7,000,000		3.54
Weighted Average		3.63

Table A-8

**AGGREGATED COMPONENT VALUES BY SIZE RANGE  
PRODUCER MILK DELIVERIES  
2002**

**Pacific Northwest Order**

<u>Size Range</u>		<u>Aggregated Component Values*</u> - dollars -	<u>Producer Milk</u> - pounds -	<u>Percent of Producer Milk</u> - % -	<u>Weighted Average Value</u> - dollars/cwt. -
<u>Equal to or more than</u> - pounds -	<u>Less than</u> - pounds -				
	50,000	\$ 3,360,018.78	26,901,343	0.34%	12.49
50,000	100,000	10,145,748.43	83,585,624	1.07%	12.14
100,000	200,000	41,098,652.77	341,633,874	4.37%	12.03
200,000	300,000	50,779,421.44	429,166,686	5.48%	11.83
300,000	400,000	44,633,958.15	378,217,868	4.83%	11.80
400,000	500,000	45,262,822.23	384,065,984	4.91%	11.79
500,000	600,000	43,399,647.54	370,205,873	4.73%	11.72
600,000	700,000	37,499,752.16	324,466,918	4.15%	11.56
700,000	1,000,000	99,073,109.41	857,560,253	10.96%	11.55
1,000,000	3,000,000	345,537,457.35	3,023,276,511	38.64%	11.43
3,000,000		183,555,511.75	1,605,549,175	20.52%	11.43
Total/Weighted Average		\$ 904,346,100.02	7,824,630,109	100.00%	11.56

**Western Order**

<u>Size Range</u>		<u>Aggregated Component Values*</u> - dollars -	<u>Producer Milk</u> - pounds -	<u>Percent of Producer Milk</u> - % -	<u>Weighted Average Value</u> - dollars/cwt. -
<u>Equal to or more than</u> - pounds -	<u>Less than</u> - pounds -				
	50,000	\$ 3,612,426.01	30,305,638	0.55%	11.92
50,000	100,000	13,893,612.36	117,470,761	2.12%	11.83
100,000	200,000	35,713,945.54	308,336,067	5.56%	11.58
200,000	300,000	25,598,299.40	223,509,539	4.03%	11.45
300,000	400,000	19,966,655.31	174,678,672	3.15%	11.43
400,000	500,000	21,483,410.08	188,234,011	3.40%	11.41
500,000	600,000	19,368,600.29	171,468,213	3.09%	11.30
600,000	700,000	17,528,551.62	154,201,389	2.78%	11.37
700,000	1,000,000	69,375,772.78	610,460,817	11.02%	11.36
1,000,000	3,000,000	237,593,105.84	2,092,996,488	37.77%	11.35
3,000,000		167,412,220.22	1,469,580,743	26.52%	11.39
Total/Weighted Average		\$ 631,546,599.46	5,541,242,338	100.00%	11.40

Table A-8 (Continued)

**AGGREGATED COMPONENT VALUES BY SIZE RANGE  
PRODUCER MILK DELIVERIES  
2002**

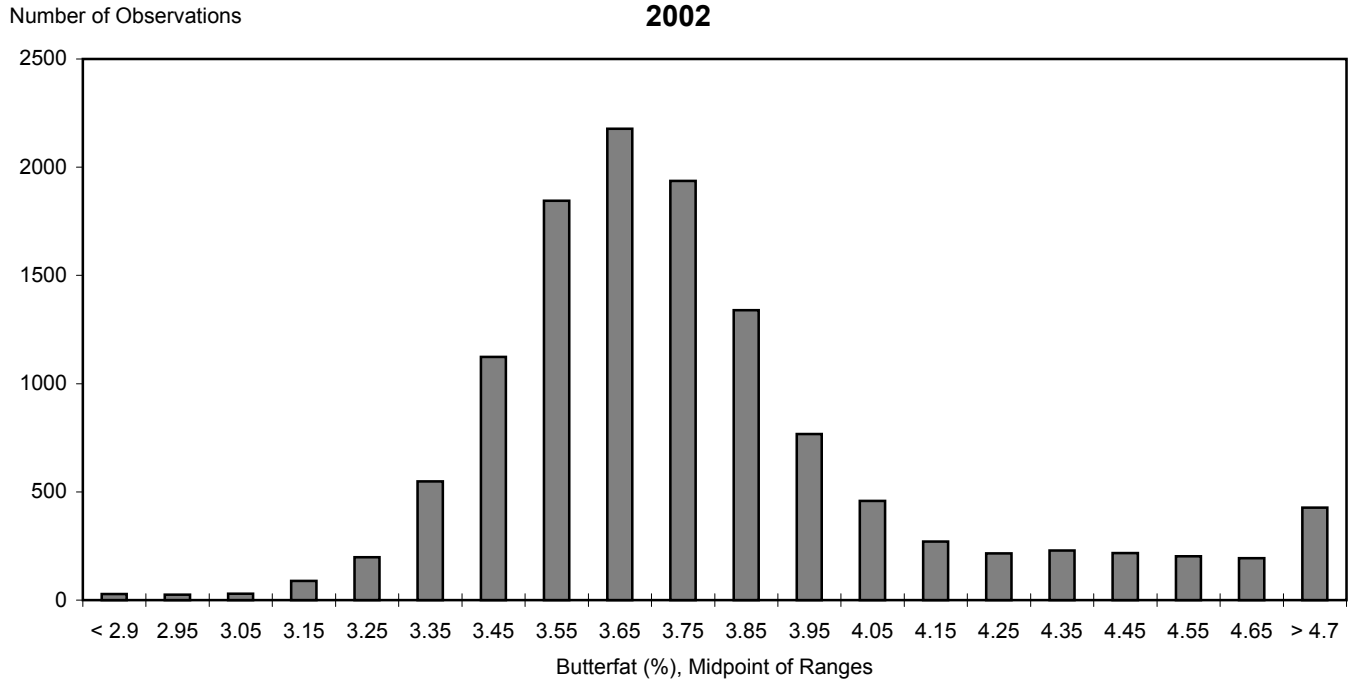
**Arizona-Las Vegas Order**

<u>Size Range</u>		<u>Aggregated Component Values*</u>	<u>Producer Milk</u>	<u>Percent of Producer Milk</u>	<u>Weighted Average Value</u>
<u>Equal to or more than</u>	<u>Less than</u>				
- pounds -	- pounds -	- dollars -	- pounds -	- % -	- dollars/cwt. -
	100,000	\$ 117,331.73	976,417	0.03%	12.02
100,000	200,000	291,265.06	2,459,630	0.08%	11.84
200,000	300,000	632,695.28	5,539,959	0.18%	11.42
300,000	400,000	928,060.39	8,137,385	0.27%	11.40
400,000	500,000	1,735,874.56	14,937,931	0.49%	11.62
500,000	600,000	3,970,523.39	34,582,165	1.14%	11.48
600,000	700,000	2,955,168.64	25,286,662	0.84%	11.69
700,000	1,000,000	15,512,190.42	132,505,544	4.38%	11.71
1,000,000	2,000,000	58,891,711.29	503,109,973	16.62%	11.71
2,000,000	3,000,000	83,712,113.19	710,328,074	23.47%	11.78
3,000,000	4,000,000	44,069,295.81	375,596,389	12.41%	11.73
4,000,000	5,000,000	34,550,016.51	296,467,284	9.80%	11.65
5,000,000	6,000,000	26,621,035.37	227,880,078	7.53%	11.68
6,000,000	7,000,000	15,437,211.92	134,406,211	4.44%	11.49
7,000,000		64,365,382.59	554,342,075	18.32%	11.61
Total/Weighted Average		\$ 353,789,876.16	3,026,555,777	100.00%	11.69

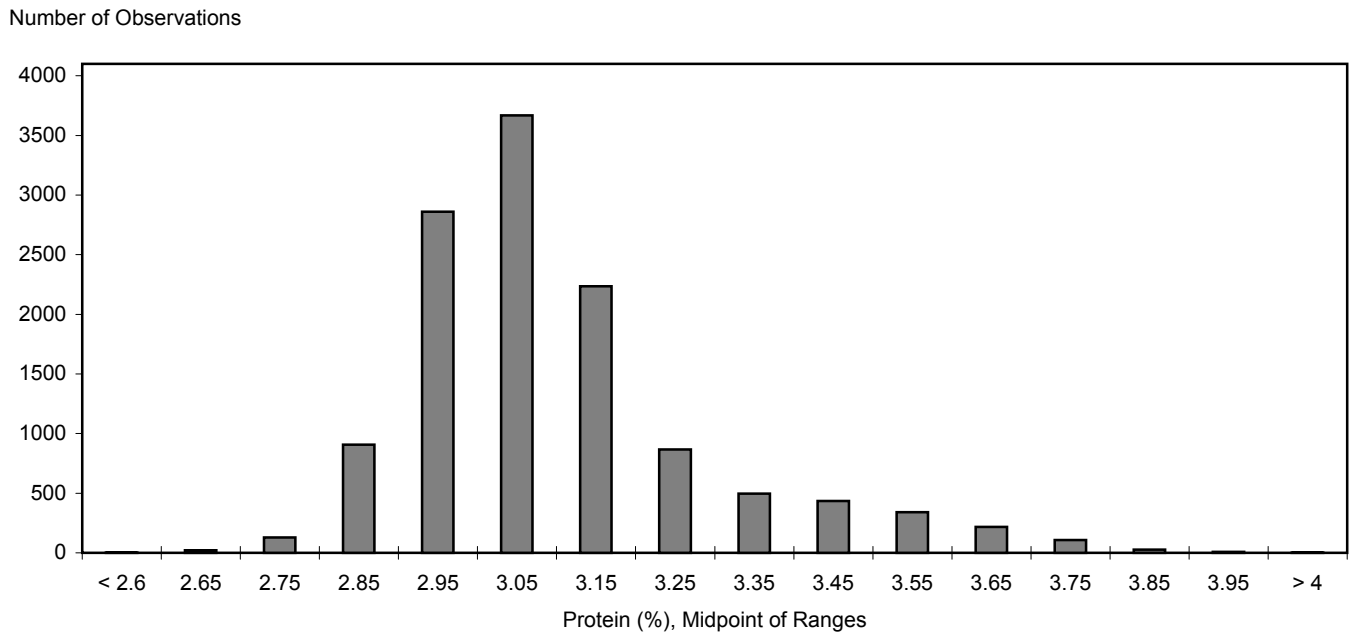
\* Based on Federal order minimum prices. Producer prices for the three orders are subject to location adjustments. The effects of the location adjustments are not dealt with in this study.



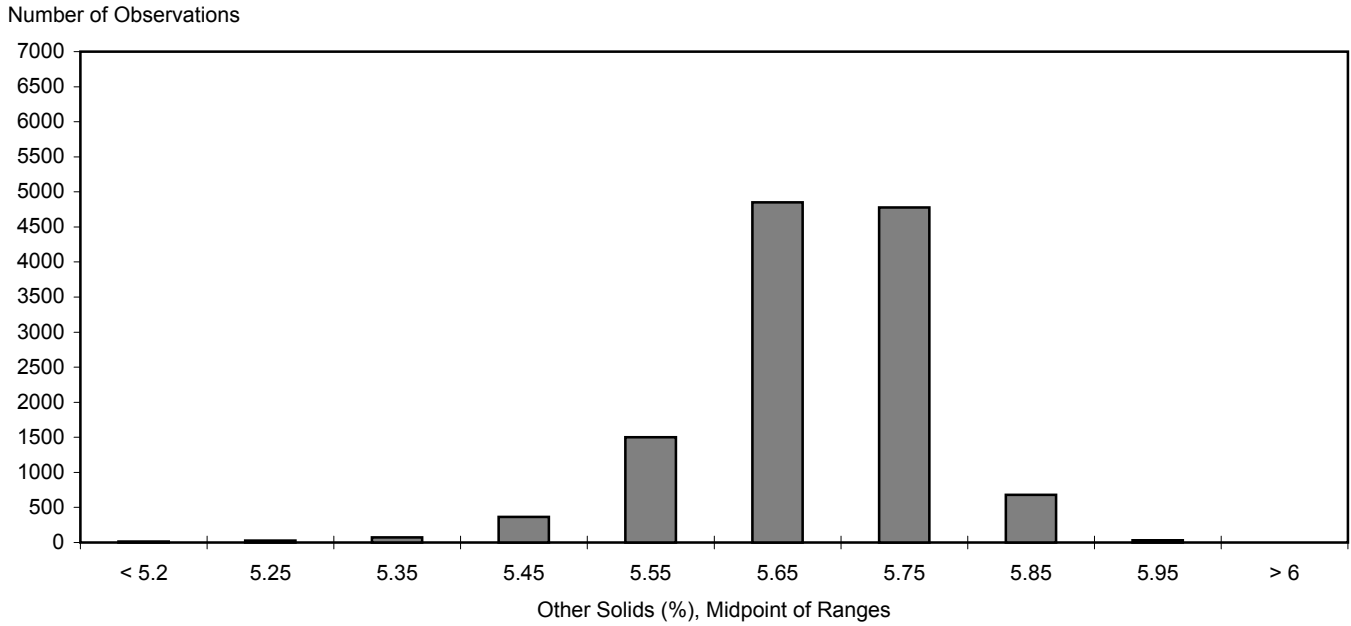
**Figure A-1**  
**FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE BUTTERFAT LEVELS:**  
**PACIFIC NORTHWEST ORDER**  
**2002**



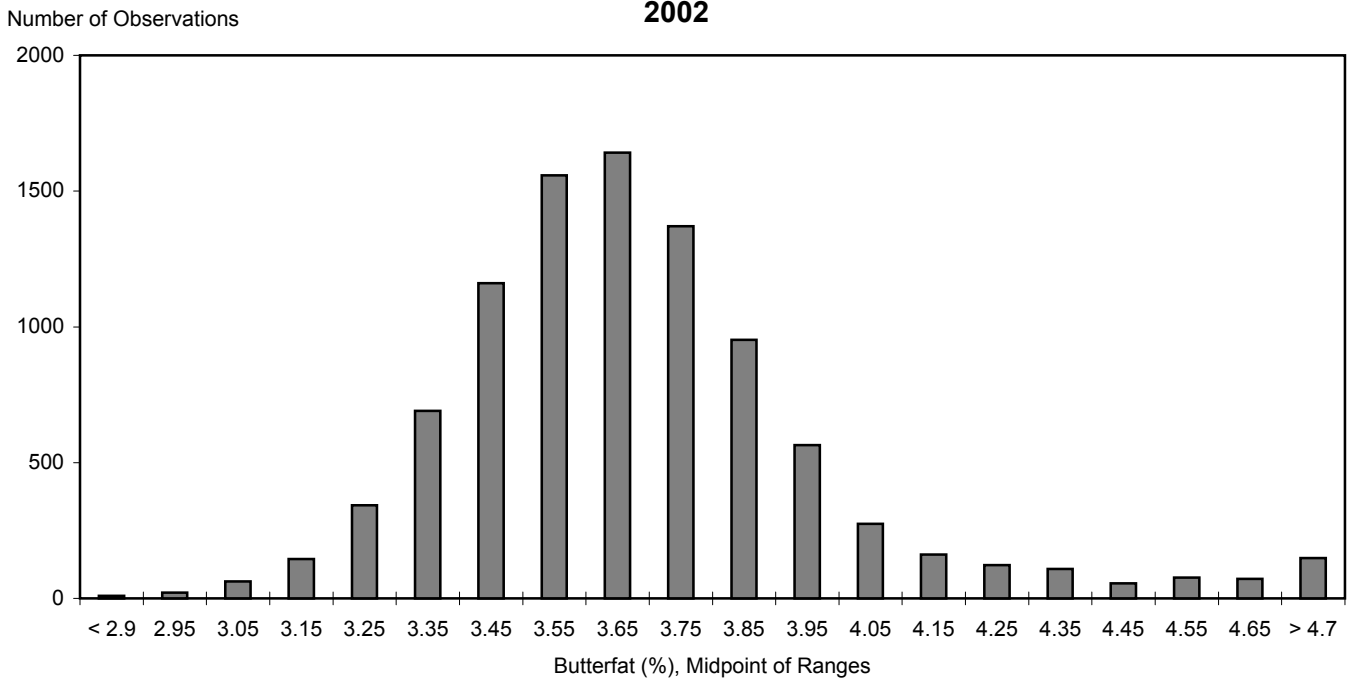
**Figure A-2**  
**FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE PROTEIN LEVELS:**  
**PACIFIC NORTHWEST ORDER**  
**2002**



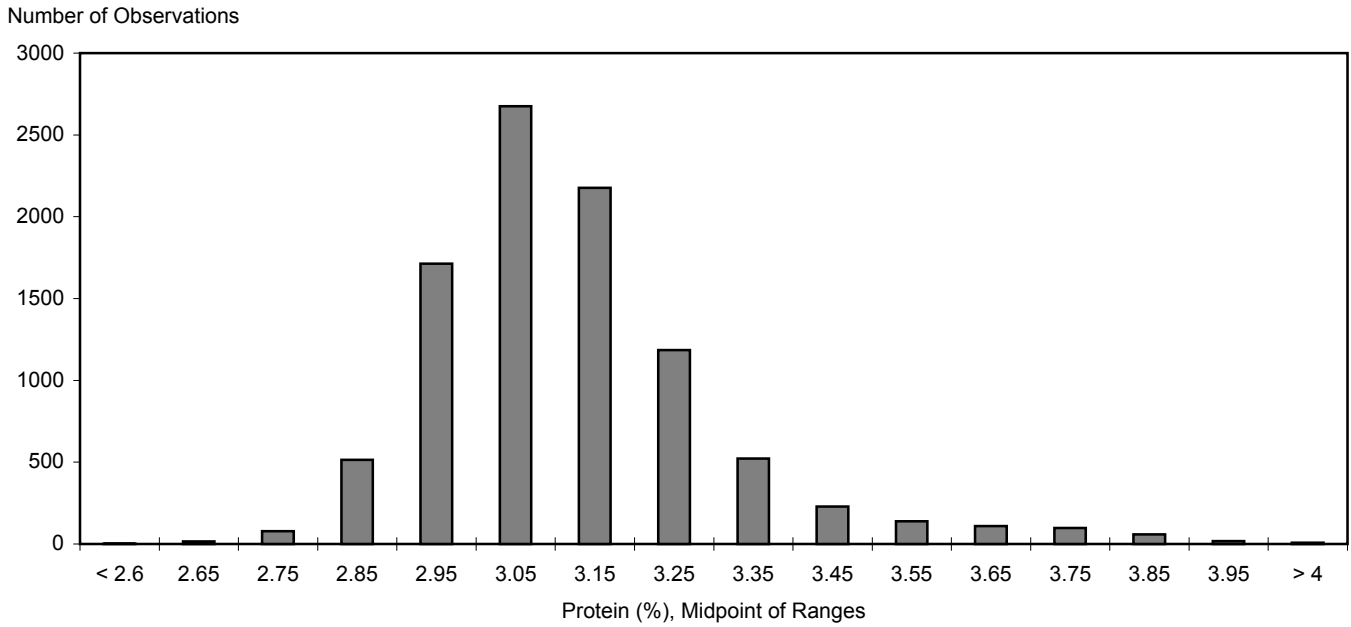
**Figure A-3**  
**FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE OTHER SOLIDS**  
**LEVELS: PACIFIC NORTHWEST ORDER**  
**2002**



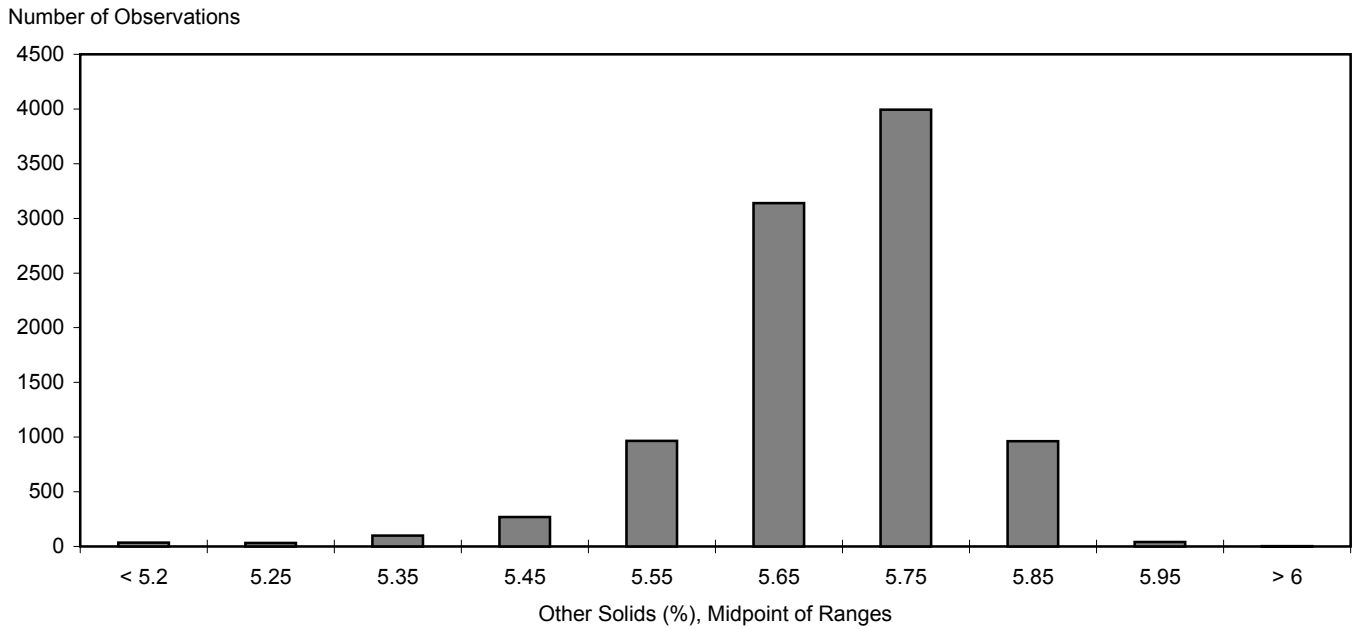
**Figure A-4**  
**FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE BUTTERFAT LEVELS:**  
**WESTERN ORDER**  
**2002**



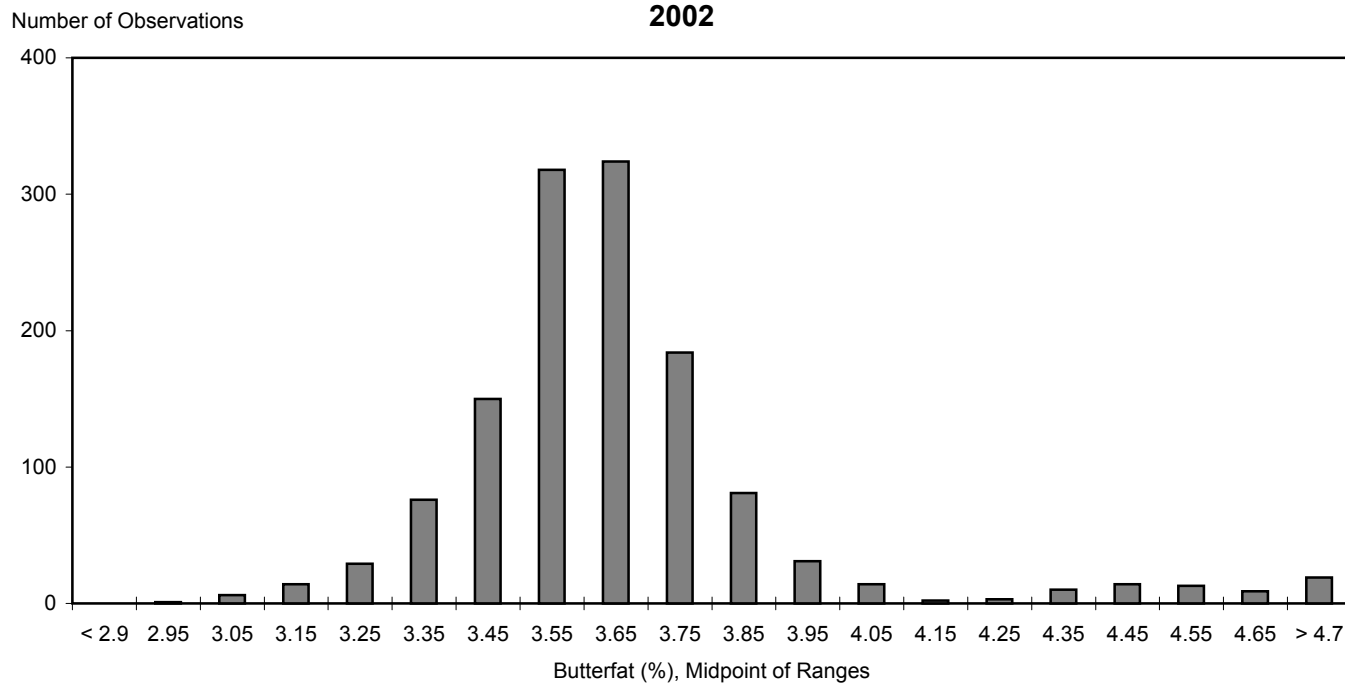
**Figure A-5**  
**FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE PROTEIN LEVELS:**  
**WESTERN ORDER**  
**2002**



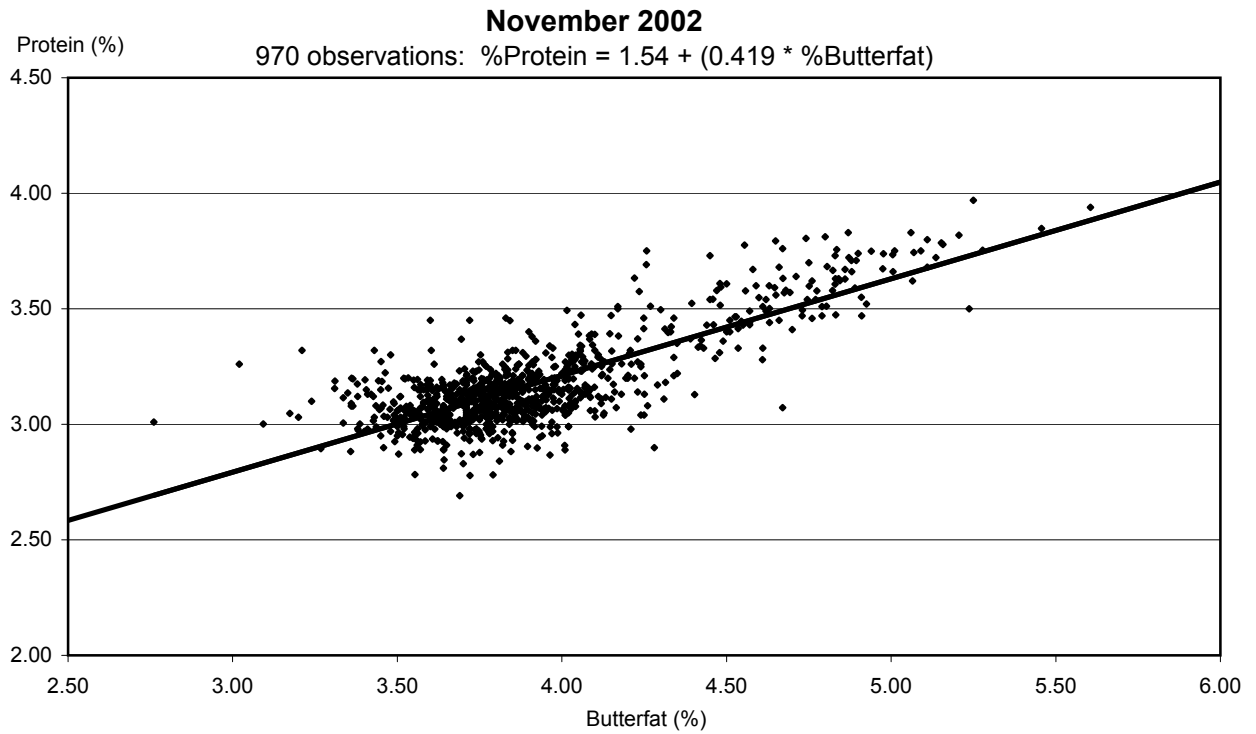
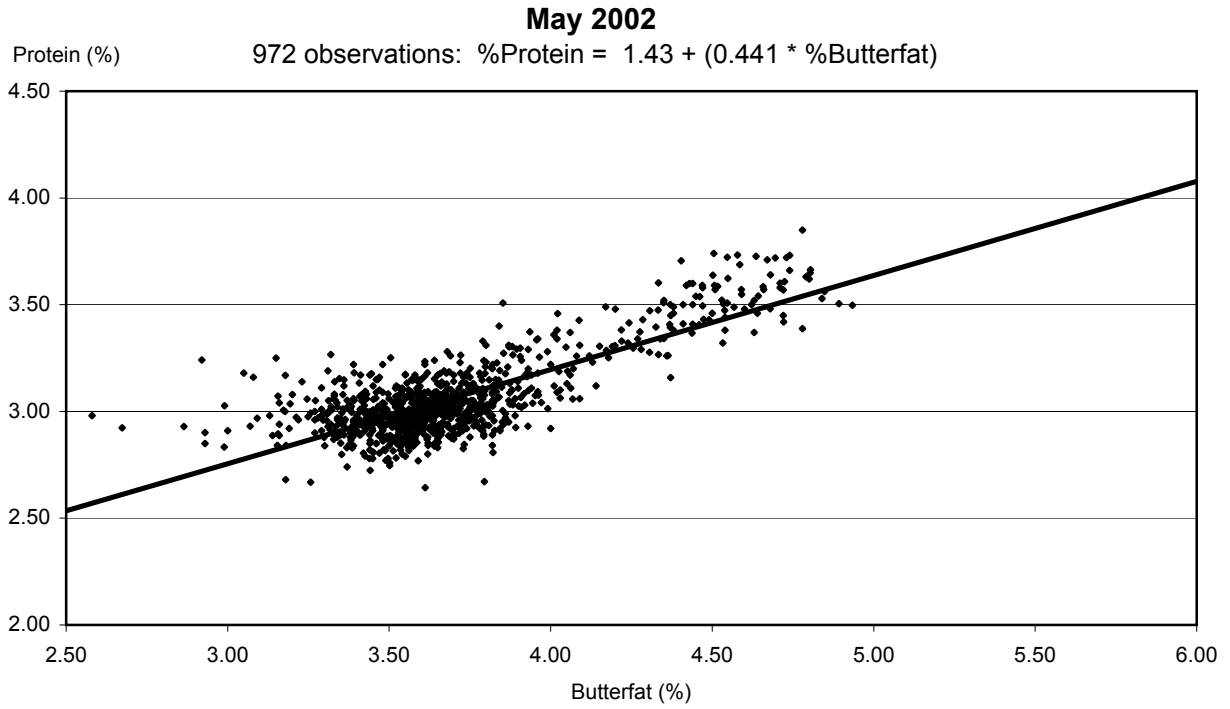
**Figure A-6**  
**FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE OTHER SOLIDS**  
**LEVELS: WESTERN ORDER**  
**2002**



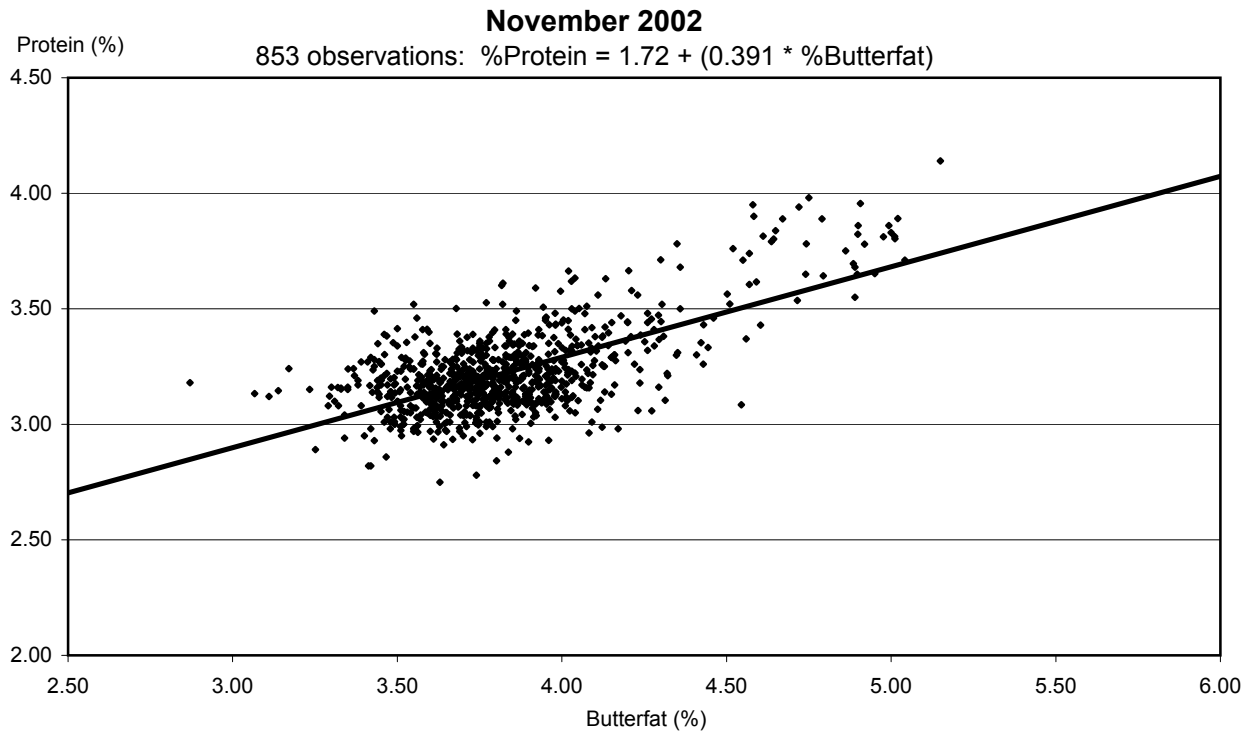
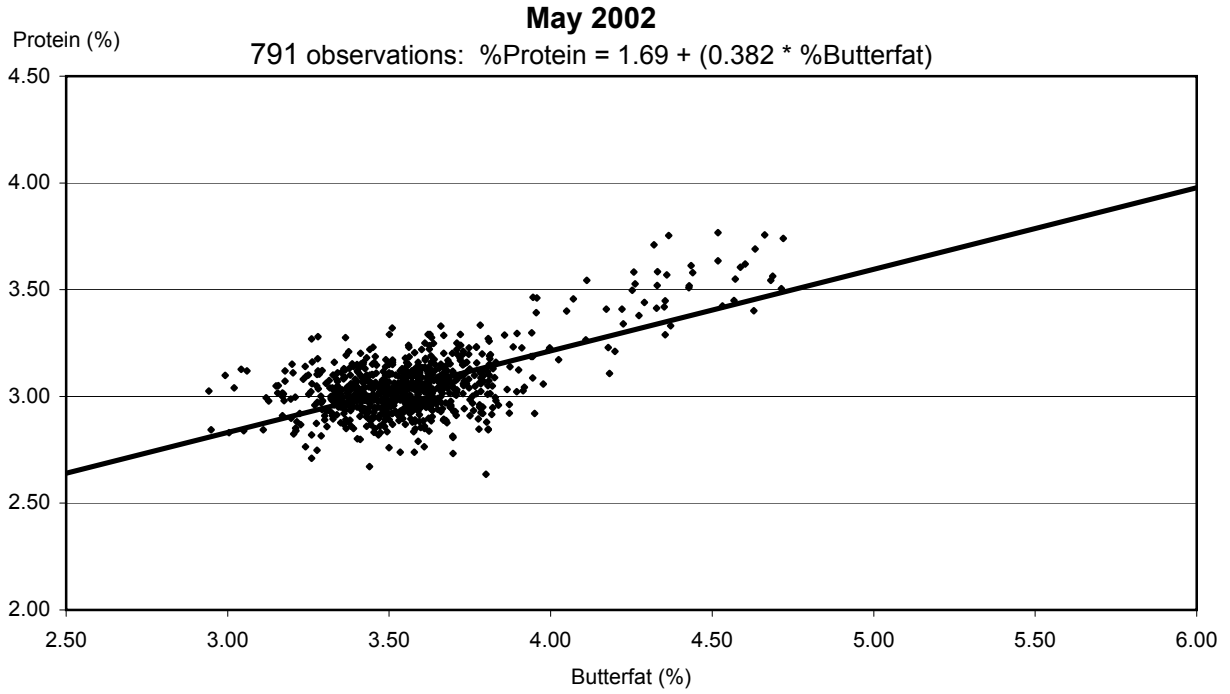
**Figure A-7**  
**FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE BUTTERFAT LEVELS:**  
**ARIZONA-LAS VEGAS ORDER**  
**2002**



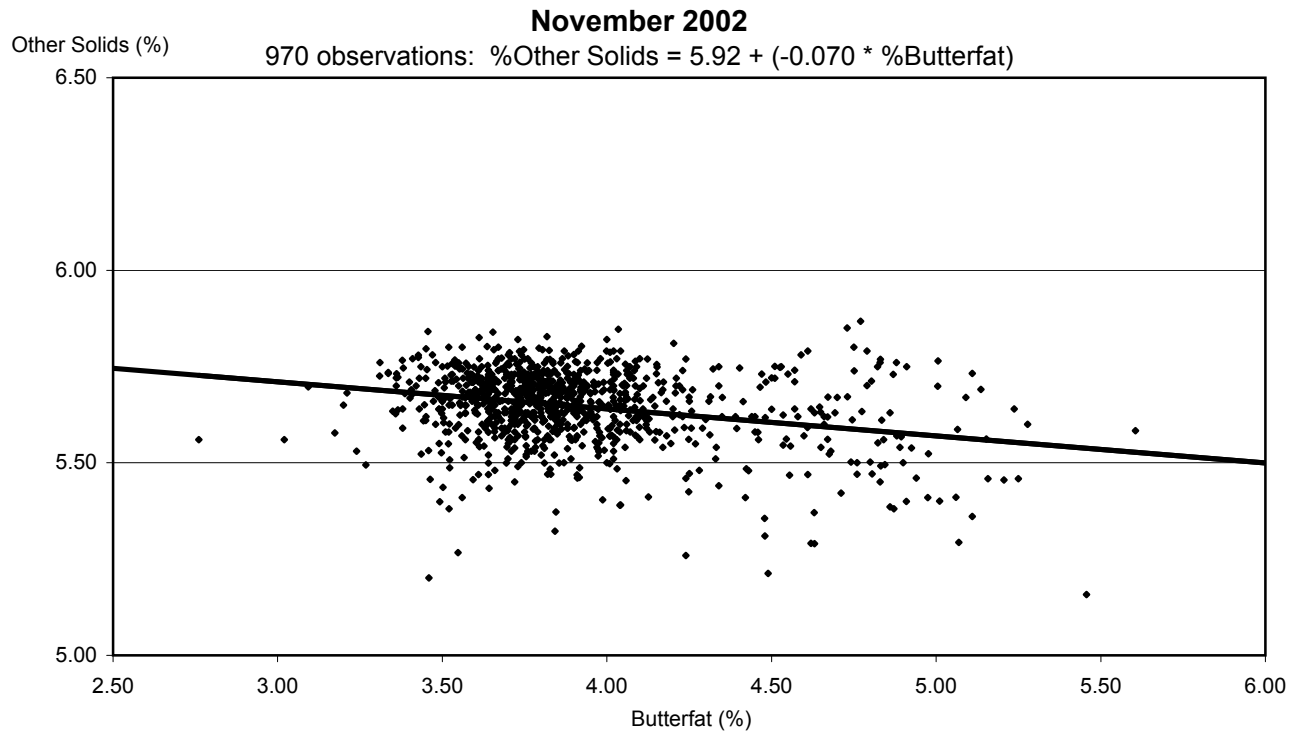
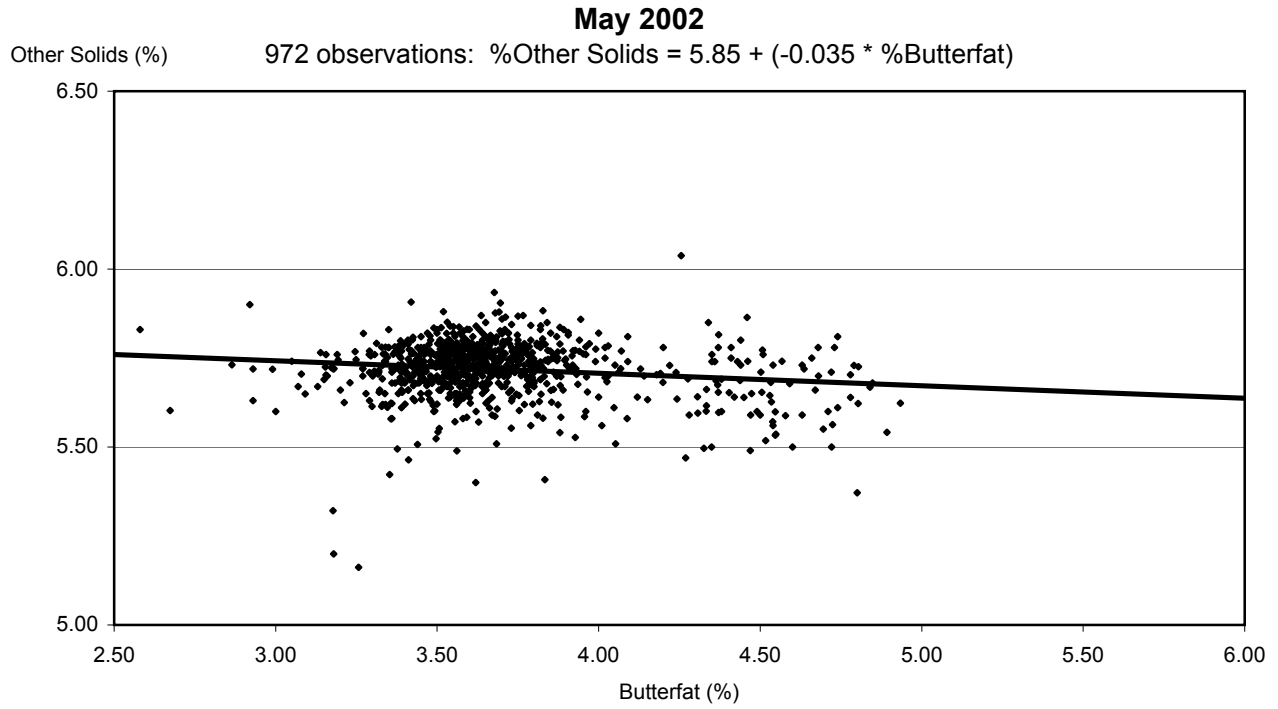
**Figure A-8**  
**SCATTER PLOT OF PROTEIN AND BUTTERFAT**  
**MAY AND NOVEMBER 2002**  
**Pacific Northwest Order**



**Figure A-9**  
**SCATTER PLOT OF PROTEIN AND BUTTERFAT**  
**MAY AND NOVEMBER 2002**  
**Western Order**

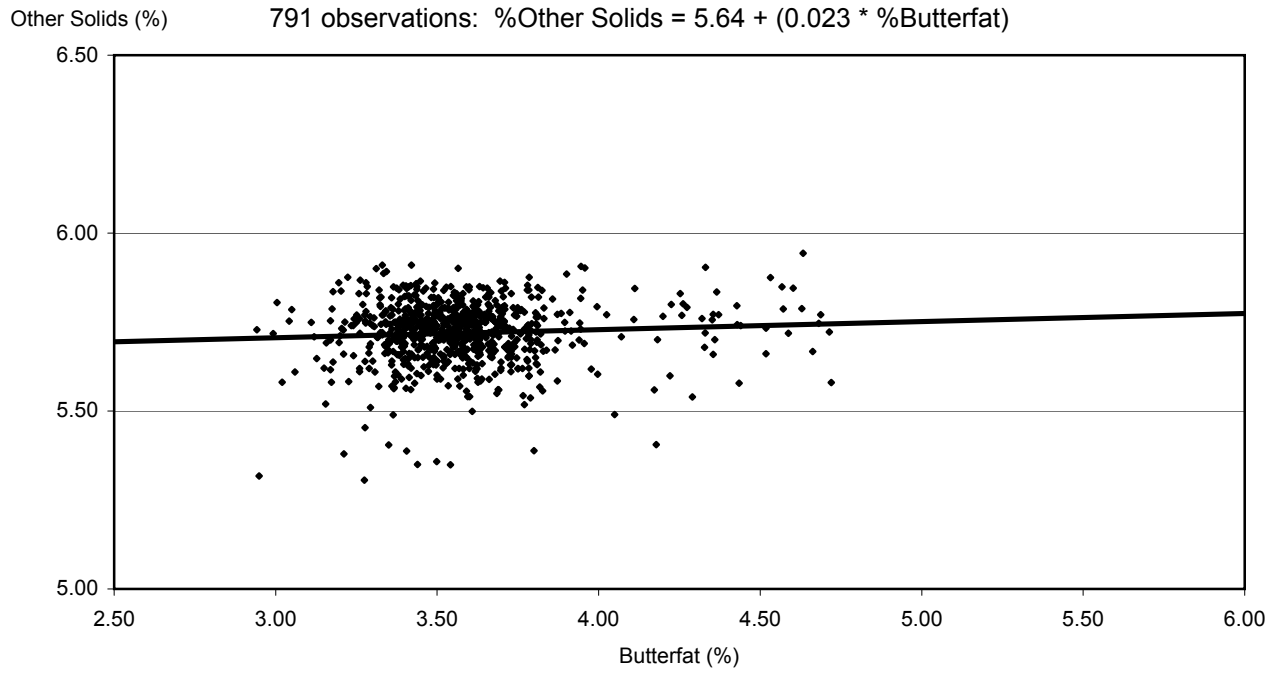


**Figure A-10**  
**SCATTER PLOT OF OTHER SOLIDS AND BUTTERFAT**  
**MAY AND NOVEMBER 2002**  
**Pacific Northwest Order**

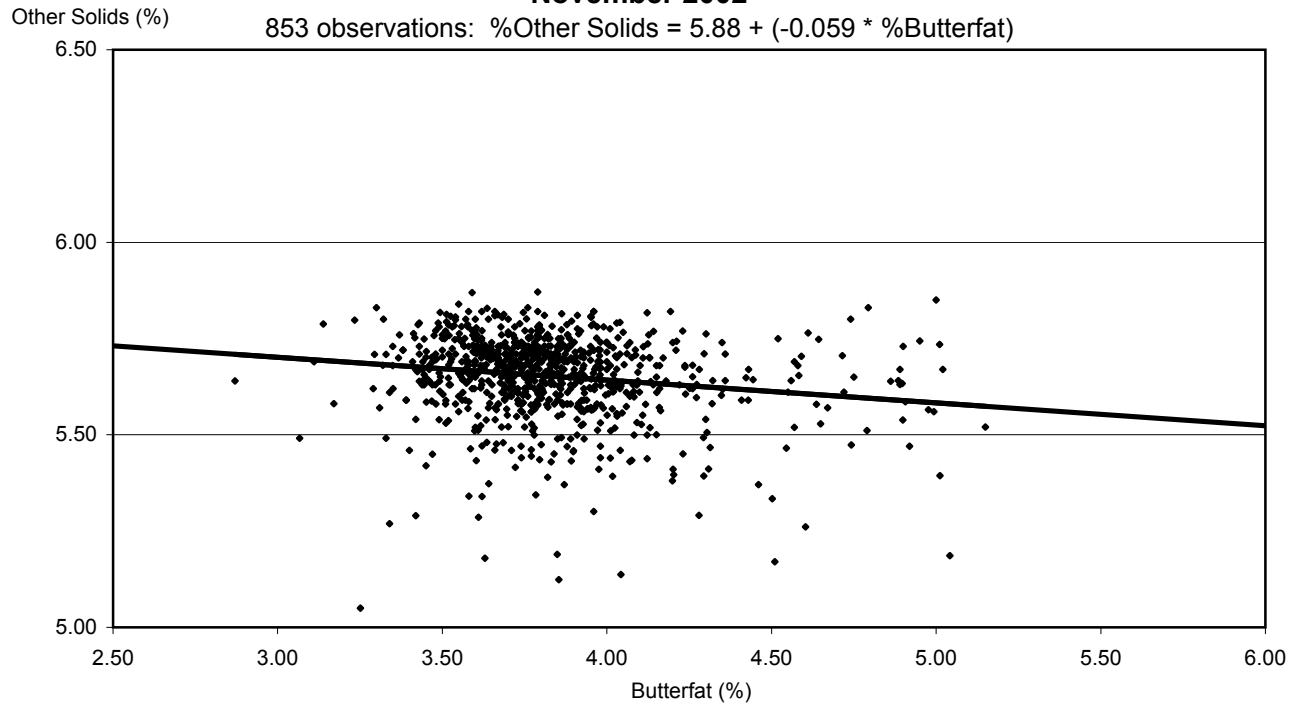


**Figure A-11**  
**SCATTER PLOT OF OTHER SOLIDS AND BUTTERFAT**  
**MAY AND NOVEMBER 2002**  
**Western Order**

**May 2001**



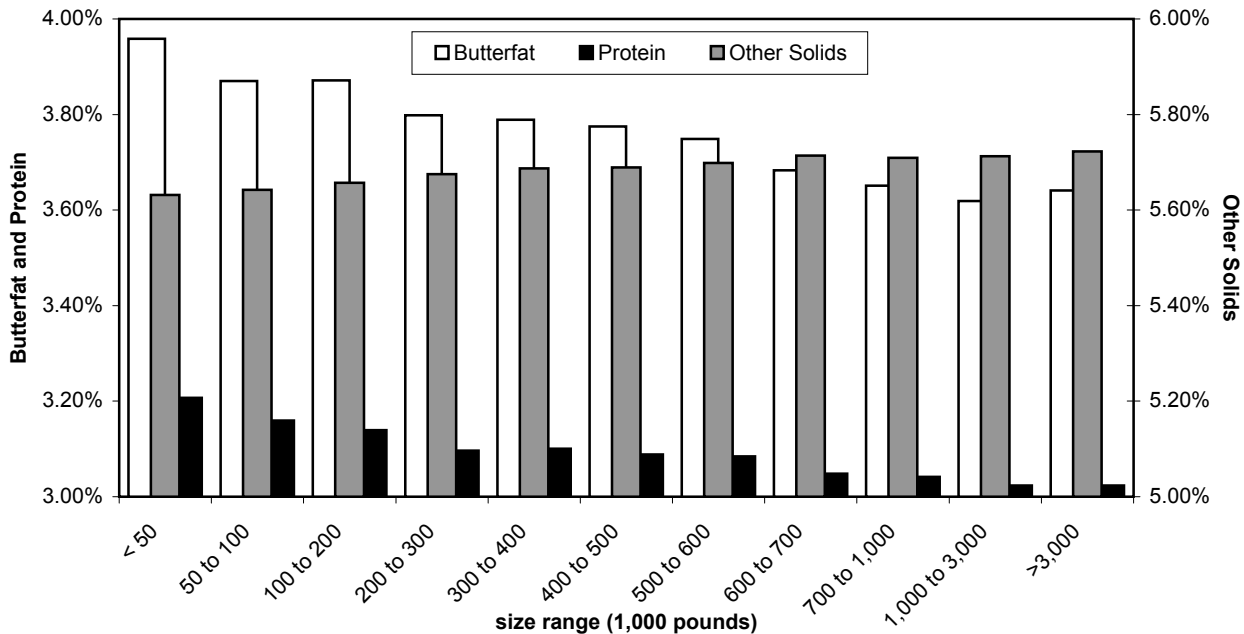
**November 2002**



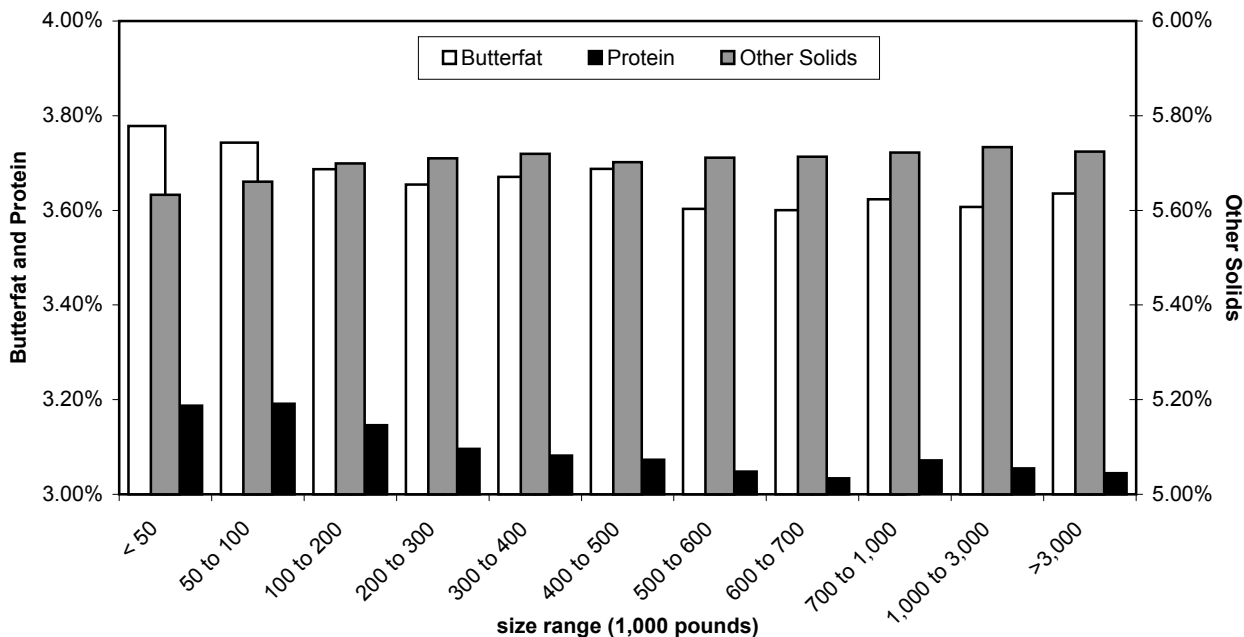


**Figure A-12**  
**WEIGHTED AVERAGE COMPONENT LEVELS**  
**BY SIZE RANGE OF PRODUCER MILK DELIVERIES**  
**2002**

**Pacific Northwest Order**

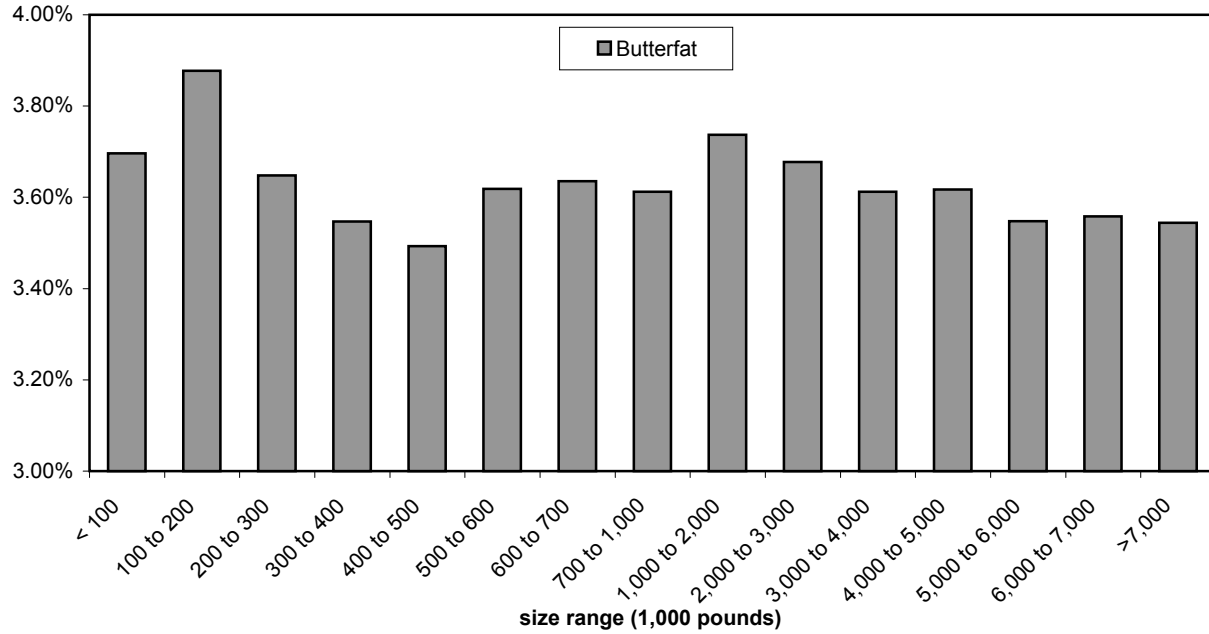


**Western Order**



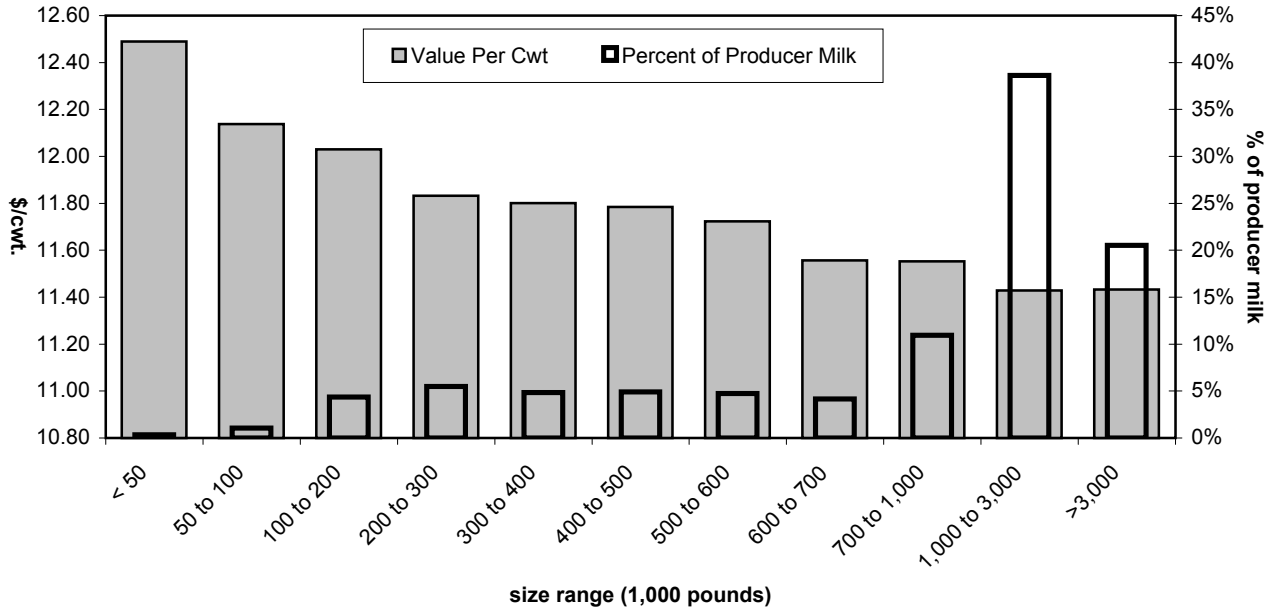
**Figure A-12 (continued)**  
**WEIGHTED AVERAGE COMPONENT LEVELS**  
**BY SIZE RANGE OF PRODUCER MILK DELIVERIES**  
**2002**

**Arizona-Las Vegas Order**

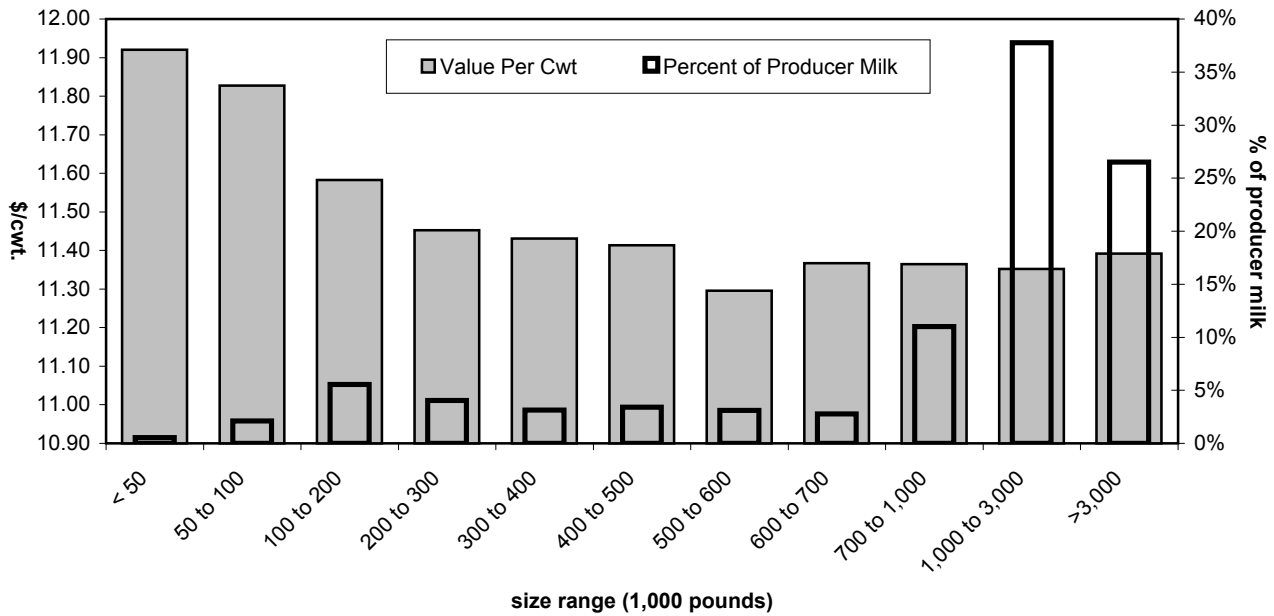


**Figure A-13**  
**WEIGHTED AVERAGE VALUES AND PERCENT OF PRODUCER MILK**  
**BY SIZE RANGE OF PRODUCER MILK DELIVERIES**  
**2002**

**Pacific Northwest Order**

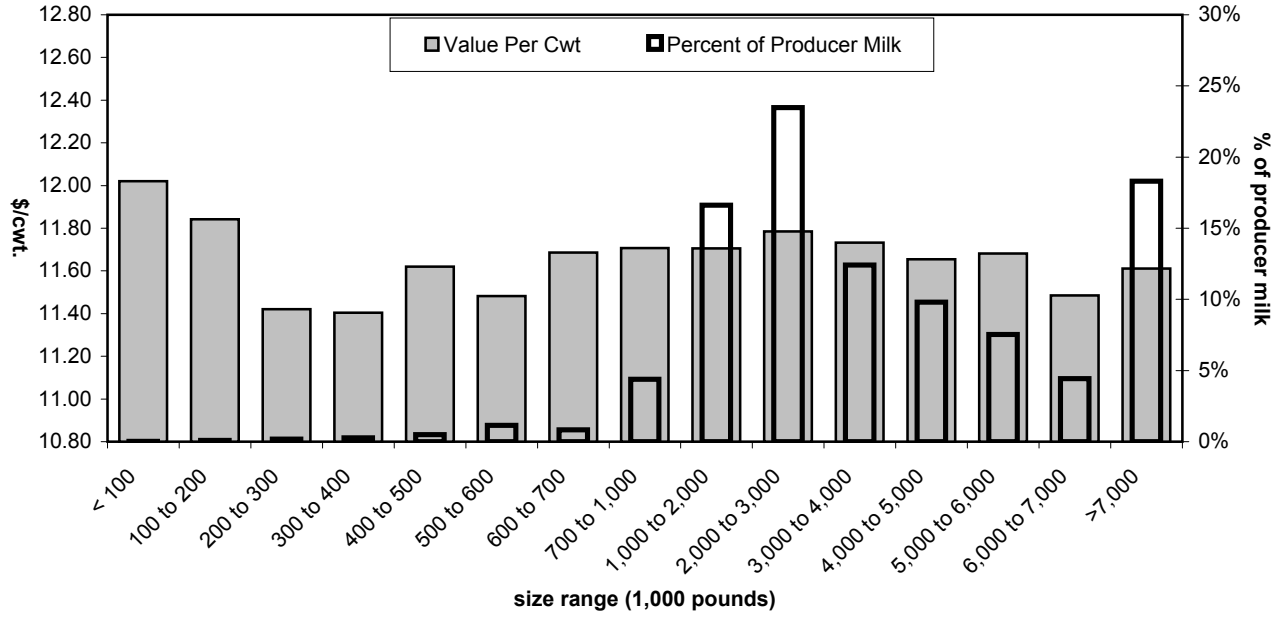


**Western Order**



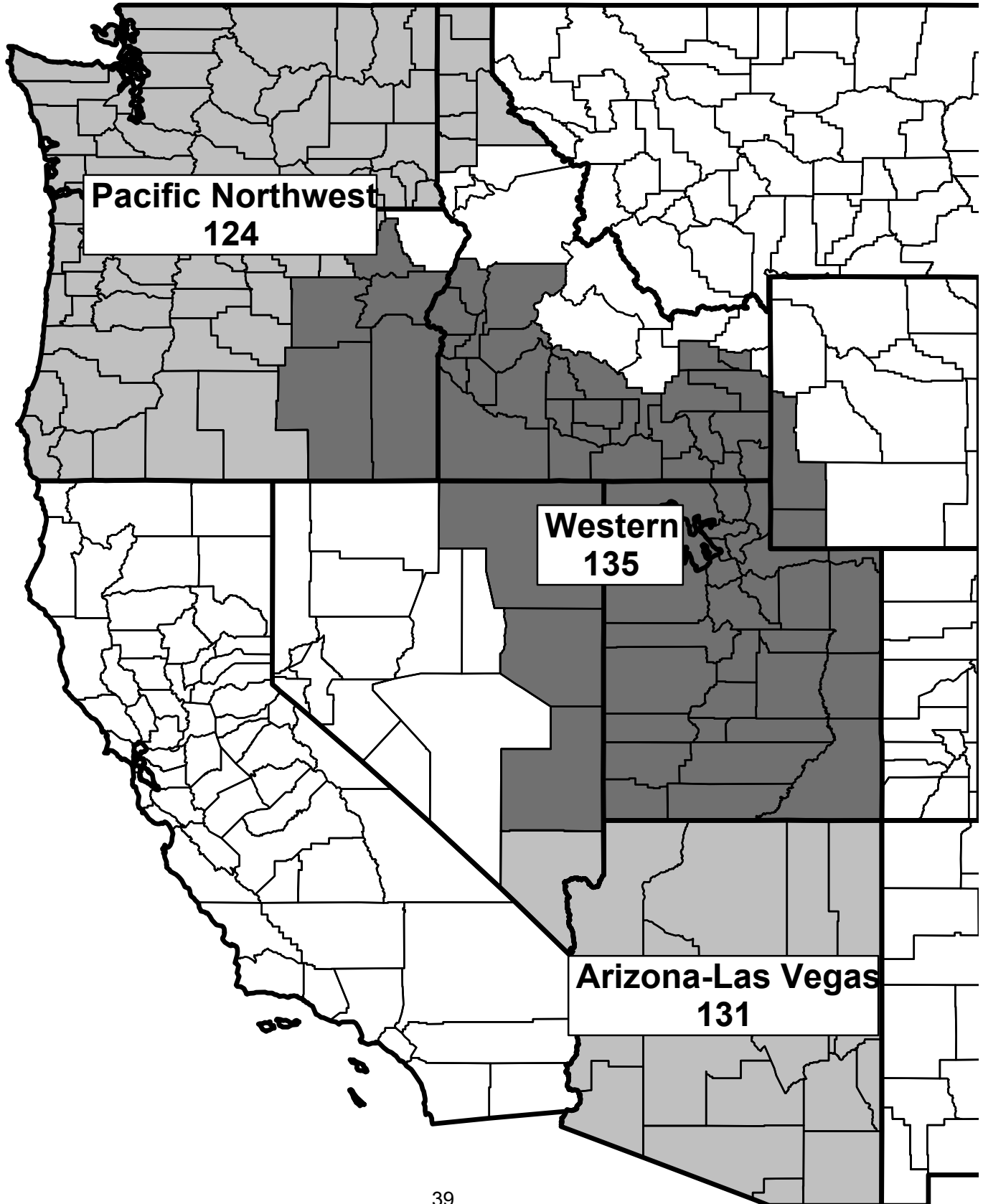
**Figure A-13 (continued)**  
**WEIGHTED AVERAGE VALUES AND PERCENT OF PRODUCER MILK**  
**BY SIZE RANGE OF PRODUCER MILK DELIVERIES**  
**2002**

**Arizona-Las Vegas Order**



**MAP A-1**

**Marketing Areas of the Pacific Northwest (FO 124), Arizona-Las Vegas (FO 131), and Western (FO 135) Federal Orders**



**Map A-2**  
**Geographic Regions Encompassing the Pacific Northwest,**  
**Arizona-Las Vegas, and Western Order Milksheds**

