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

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

2003

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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 2003 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 2003, a monthly average total of 1,643 producers were pooled on the Pacific Northwest, Arizona-Las Vegas, and Western Orders. During 2003, these producers delivered 14.0 billion pounds to the three markets. The milk shed of the three Federal orders includes Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

Major findings of this study include:

1. The 2003 average component levels for the Pacific Northwest Order were 3.66% butterfat, 3.04% true protein, and 5.69% other solids. The 2003 average component levels for the Western Order were 3.60% butterfat, 3.04% true protein, and 5.70% other solids. The 2003 average butterfat level for the Arizona-Las Vegas Order was 3.59%.
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 2003 for protein is PRO% = 1.45 + 0.432 * BF%, with an R-squared of 0.66. The Western Order's linear regression in 2003 for protein is PRO% = 1.53 + 0.427 * BF%, with an R-squared of 0.48.
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.

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2003

Chris Werner [1/]

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 2003. 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 2003, 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 2003 was valued using Federal order minimum producer prices for the respective orders.

For 2003, a monthly average total of 1,643 producers were pooled on the Pacific Northwest, Arizona-Las Vegas, and Western Orders. During 2003, these producers delivered 14.0 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 2003, the Pacific Northwest Order milk shed was comprised of producers located in Washington, Oregon, California, and Idaho. The Western Order milk shed was comprised of producers located in Southern Idaho, Utah, California, Washington, Eastern Oregon, Colorado, New Mexico, Nevada, and Wyoming. 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 (Arizona, Central

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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 2003, 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, and Nevada were combined for reasons of confidentiality. The Arizona, Texas, New Mexico, 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[1]. 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 2003, producers associated with the Pacific Northwest Order delivered 6,331.1 million pounds, but not all eligible milk was pooled. (See asterisked months in Table 1.) For 2003, producer milk tested, on average, 3.66% butterfat, 3.04% protein, and 5.69% 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 and protein 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 2003 were the highest in December at 3.83% and lowest in August at 3.53%. The seasonal cycle of protein levels is similar to butterfat but with a lesser degree of variation. Protein levels in 2003 were highest in November at 3.17% 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 levels reached a peak of 5.71% in May through July, and a low of 5.66% in October and showed very little seasonality.

In 2003, producers associated with the Western Order delivered 4,577.7 million pounds, but not all eligible milk was pooled. (See asterisked months in Table 2.) For 2003, producer milk tested, on average, 3.60% butterfat, 3.04% protein, and 5.70% other solids.

[1] Climate information based on Western Regional Climate Center precipitation maps.

Table 1
Monthly Component Levels
Pacific Northwest Order
2003

Month	Butterfat	Protein	Other Solids
	- percent -	- percent -	- percent -
January *	3.71	3.04	5.68
February *	3.69	3.02	5.69
March *	3.68	3.03	5.69
April *	3.65	3.01	5.70
May *	3.62	2.99	5.71
June *	3.57	2.98	5.71
July *	3.54	2.96	5.71
August *	3.53	2.98	5.69
September *	3.62	3.05	5.68
October *	3.66	3.09	5.66
November *	3.82	3.17	5.67
December *	3.83	3.15	5.67
Weighted Average	3.66	3.04	5.69

* Eligible milk not pooled.

Table 2
Monthly Component Levels
Western Order
2003

Month	Butterfat	Protein	Other Solids
	- percent -	- percent -	- percent -
January *	3.68	3.07	5.68
February	3.65	3.05	5.69
March *	3.63	3.05	5.71
April*	3.61	3.04	5.70
May	3.55	2.99	5.71
June	3.48	2.97	5.71
July *	3.46	2.91	5.71
August *	3.45	2.94	5.70
September *	3.55	3.03	5.70
October *	3.60	3.10	5.69
November *	3.73	3.17	5.70
December *	3.74	3.16	5.70
Weighted Average	3.60	3.04	5.70

* Eligible milk not pooled.

Table 3 Monthly Component Levels Arizona-Las Vegas Order 2003	
Month	Butterfat - percent -
January	3.63
February	3.58
March	3.59
April	3.57
May	3.54
June	3.54
July	3.56
August	3.54
September *	3.57
October *	3.61
November	3.69
December	3.71
Weighted Average	3.59

* Eligible milk not pooled.

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 2003 were highest in December at 3.74% and lowest in August at 3.45%. Protein levels in 2003 were highest in November at 3.17% and lowest in July at 2.91%. 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 5.71% in March and May through July, and a low of 5.68% in January and showed very little seasonality.

In 2003, producers associated with the Arizona-Las Vegas Order delivered 3,061.2 million pounds. For 2003, producer milk tested, on average, 3.59% 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 2003 were highest in December at 3.71% and lowest in May, June, and August at 3.54%. 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 2003, 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

Table 4
Component Levels: Weighted Average, Mean, Median, Standard Deviation, Minimum, and Maximum
Pacific Northwest Order
2003

	Butterfat	Protein	Other Solids
	%	%	%
Weighted Average	3.66	3.04	5.69
Mean	3.77	3.08	5.66
Median	3.69	3.04	5.67
Standard Deviation	0.36	0.19	0.10
Minimum	2.74	2.56	4.56
Maximum	5.76	4.14	6.00

Table 5
Component Levels: Weighted Average, Mean, Median, Standard Deviation, Minimum, and Maximum
Western Order
2003

	Butterfat	Protein	Other Solids
	%	%	%
Weighted Average	3.60	3.04	5.70
Mean	3.66	3.10	5.68
Median	3.62	3.07	5.69
Standard Deviation	0.31	0.19	0.11
Minimum	2.57	2.49	4.64
Maximum	5.37	4.11	5.97

Table 6
Component Levels: Weighted Average, Mean, Median, Standard Deviation, Minimum, and Maximum
Arizona-Las Vegas Order
2003

	Butterfat
	%
Weighted Average	3.59
Mean	3.62
Median	3.57
Standard Deviation	0.30
Minimum	2.38
Maximum	4.94

Pacific Northwest and Western 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 2003, for the Pacific Northwest Order, producers' individual monthly average butterfat tests ranged from 2.74% to 5.76%; protein tests ranged from 2.56% to 4.14%, and other solids levels ranged from 4.56% to 6.00%. (See Table 4.) Most monthly average component tests are within one standard deviation of the mean[2]. Based on the definition of a standard deviation, most producers had butterfat tests ranging from 3.41% to 4.13%. Similarly, most protein tests ranged from 2.89% to 3.27%, and most other solids tests ranged from 5.56% to 5.76%. (See Appendix Table A-1 for monthly component statistics.)

In 2003, Western Order producer butterfat tests ranged from 2.57% to 5.37%, protein tests ranged from 2.49% to 4.11%, and other solids tests ranged from 4.64% to 5.97%. (See Table 5.) Based on the definition of a standard deviation, most producers had butterfat tests ranging from 3.35% to 3.97%. Similarly, most protein tests ranged from 2.91% to 3.29%, and most other solids tests ranged from 5.57% to 5.79%. (For monthly component statistics, see Appendix Table A-2.)

In 2003, Arizona-Las Vegas Order producer butterfat tests ranged from 2.38% to 4.94%. (See Table 6.) Based on the definition of a standard deviation, most producers had butterfat tests ranging from 3.32% 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 2003 milk production, average number of producers, and component tests for each region. In 2003, the region with the most milk associated with the Pacific Northwest Order was Region 1 followed by Regions 2, 5, 3, 6, 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 and central California and Oklahoma producers pooled on the Western Order.

[2] By definition, for a *normal distribution*, approximately 68% of observations are within one standard deviation of the mean.

Table 7 Various Statistics by Region For 2003			
Region 1 (Western Washington)		**Region 2 (Central Washington)**	
Milk Production	2,837,443,037	Milk Production	1,470,601,406
Average Number of Producers	439	Average Number of Producers	84
Average Pounds Per Producer	538,516	Average Pounds Per Producer	1,457,484
Butterfat Test	3.62%	Butterfat Test	3.59%
Protein Test	3.03%	Protein Test	2.98%
Other Solids Test	5.67%	Other Solids Test	5.68%
Region 3 (Eastern Washington)		**Region 4 (Northern Idaho)**	
Milk Production	403,504,639	Milk Production	17,971,583
Average Number of Producers	52	Average Number of Producers	12
Average Pounds Per Producer	652,920	Average Pounds Per Producer	126,560
Butterfat Test	3.60%	Butterfat Test	3.80%
Protein Test	3.02%	Protein Test	3.07%
Other Solids Test	5.69%	Other Solids Test	5.64%
Region 5 (Western Oregon)		**Region 6 (Central Oregon)**	
Milk Production	1,291,507,125	Milk Production	372,754,261
Average Number of Producers	224	Average Number of Producers	21
Average Pounds Per Producer	480,471	Average Pounds Per Producer	1,509,127
Butterfat Test	3.79%	Butterfat Test	3.89%
Protein Test	3.09%	Protein Test	3.17%
Other Solids Test	5.72%	Other Solids Test	5.75%
Region 7 (Eastern Oregon)		**Region 8 (Southern Idaho)**	
Milk Production	47,185,060	Milk Production	2,276,036,289
Average Number of Producers	26	Average Number of Producers	315
Average Pounds Per Producer	150,751	Average Pounds Per Producer	601,967
Butterfat Test	3.68%	Butterfat Test	3.60%
Protein Test	3.06%	Protein Test	3.03%
Other Solids Test	5.66%	Other Solids Test	5.71%
Region 9 (Greater Utah)		**Region 10 (Arizona/California)**	
Milk Production	1,304,125,264	Milk Production	3,948,948,908
Average Number of Producers	311	Average Number of Producers	159
Average Pounds Per Producer	349,257	Average Pounds Per Producer	2,064,270
Butterfat Test	3.59%	Butterfat Test	3.60%
Protein Test	3.03%	Protein Test	n/a
Other Solids Test	5.71%	Other Solids Test	n/a

n/a = not applicable

In general, comparing all the regions, Region 10 had the most milk pooled in 2003, with 3.9 billion pounds, while Region 1 had the most producers (439 producers on average). Average milk production per producer was the highest in Region 10 with an average of 2.1 million pounds per producer for the year. The highest butterfat levels in 2003 were in Region 6 with annual tests of 3.89%, while Regions 2 and 9 had the lowest annual butterfat test of 3.59%. Protein levels in Region 6 (3.17%) and other solids levels in Region 6 (5.75%) were the highest for each of those components.

Producer milk, number of producers, and average milk production per producer varied greatly between regions. Some differences in component levels were also evident. In 2003, butterfat levels in Regions 4, 5, and 6 were noticeably higher than the other regions, while Regions 2, 3, 8, and 9 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 0.11% between the high and low for the year 2003.

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 9,947 observations in 2003, compared to the Western Order's 8,499 observations. The linear regression for protein and butterfat for 2003 varied between the Pacific Northwest and Western Orders. The regression equation calculated for each order was:

Pacific Northwest:	PRO% = 1.4520 + 0.4319 BF% R^2 = 0.6606
Western:	PRO% = 1.5349 + 0.4269 BF% R^2 = 0.4833

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[3]. Appendix Figures A-8 and A-9 show graphical representations of the linear regressions for May and November 2003.

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 through 2003. (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 consolidation, implemented

[3] See *Analysis of Component Levels and Somatic Cell Count in Individual Herd Milk at the Farm Level, 2002,* Upper Midwest Marketing Area, Staff paper 03-01, December 2003.

January 2000, changed dramatically what milk was included for analysis for Federal Order 135 (recently 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 below.

Table 8
Pacific Northwest and Western Federal Orders*
Comparison of Regression Results: Butterfat Level as a Predictor of Protein Levels
1997 through 2003

Year	Equation	Correlation
1997	CRUDE PRO% = 1.917 + 0.360 BF%	$R^2 = 0.512$
1998	CRUDE PRO% = 1.810 + 0.390 BF%	$R^2 = 0.538$
1999	CRUDE PRO% = 1.809 + 0.395 BF%	$R^2 = 0.561$
2000	TRUE PRO% = 1.632 + 0.390 BF%	$R^2 = 0.533$
2001	TRUE PRO% = 1.615 + 0.400 BF%	$R^2 = 0.534$
2002	TRUE PRO% = 1.575 + 0.410 BF%	$R^2 = 0.560$
2003	TRUE PRO% = 1.544 + 0.415 BF%	$R^2 = 0.554$

* 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 2003 averaged $11.47 per hundredweight. The weighted average value of each component comprising the $11.47 per hundredweight was: $4.41 for butterfat; $6.87 for protein; $0.07 for other solids; and a producer price differential of $0.12.[4]

The value of producers' milk at test pooled on the Western Order in 2003 averaged $11.17 per hundredweight. The weighted average value of each component comprising the $11.17 per hundredweight was: $4.30 for butterfat; $6.47 for protein; $0.06 for other solids; and a producer price differential of $0.34. [4]

[4] 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 2003 averaged $11.89 per hundredweight. The weighted average value of skim and butterfat portions of the $11.89 per hundredweight was: $4.35 for butterfat; and $7.54 for skim.[5]

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 2003 Federal order prices, producers with less than 50,000 pounds of production received more per hundredweight, $12.52, than other producers. Producers with more than three million pounds of production averaged the lowest amount per hundredweight, at $11.19. 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, $12.59, than other producers. Producers with more than three million pounds of production averaged the lowest amount per hundredweight, at $11.03. 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 per hundredweight; 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

[5] 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 2003 were: 3.66% butterfat, 3.04% protein, and 5.69% other solids. Butterfat and protein percentages peaked in December and reached a low in August and 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 some 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:

$$\text{Protein} = 1.4520 + 0.4319 * \text{Butterfat} \qquad (R^2 = 0.6606)$$

In 2003, the Federal order weighted average price received for milk was $11.47 per hundredweight, at test.

Weighted average component levels for the Western Order in 2003 were: 3.60% butterfat, 3.04% protein, and 5.70% other solids. Butterfat and protein percentages peaked in December and November and reached a low in August and 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:

$$\text{Protein} = 1.5349 + 0.4269 * \text{Butterfat} \qquad (R^2 = 0.4833)$$

In 2003, the Federal order weighted average price received for milk was $11.17 per hundredweight, at test.

The annual average butterfat level for the Arizona-Las Vegas Order in 2003 was 3.59%. Butterfat levels peaked in December and reached a low in May, June, and August. In 2003, the Federal order weighted average price received for milk was $11.89 per hundredweight, at test.

In 2003, the minimum order value of producer milk at test pooled on the Pacific Northwest Order averaged $11.47, the Western Order averaged $11.17, and the Arizona-Las Vegas Order averaged $11.89. 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

2003

Butterfat

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	3.71	3.83	0.36	3.74	3.11	5.43	918
February	3.69	3.80	0.35	3.71	3.06	5.39	908
March	3.68	3.80	0.35	3.70	2.91	5.04	912
April	3.65	3.77	0.35	3.68	2.87	5.06	909
May	3.62	3.72	0.35	3.64	2.99	5.02	903
June	3.57	3.65	0.33	3.57	2.93	4.93	897
July	3.54	3.61	0.30	3.55	2.83	4.90	685
August	3.53	3.61	0.30	3.55	2.85	4.98	705
September	3.62	3.71	0.32	3.66	2.74	5.25	691
October	3.66	3.76	0.33	3.69	3.04	5.04	693
November	3.82	3.95	0.39	3.86	3.07	5.39	835
December	3.83	3.94	0.38	3.86	3.14	5.76	891
For the Year	3.66	3.77	0.36	3.69	2.74	5.76	9,947

Protein

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	3.04	3.08	0.19	3.04	2.68	3.80	918
February	3.02	3.06	0.18	3.02	2.62	3.75	908
March	3.03	3.07	0.18	3.03	2.63	3.75	912
April	3.01	3.05	0.18	3.01	2.61	3.72	909
May	2.99	3.04	0.19	3.00	2.61	3.82	903
June	2.98	3.02	0.18	2.97	2.56	3.72	897
July	2.96	2.98	0.16	2.95	2.58	3.72	685
August	2.98	3.01	0.17	2.98	2.61	3.93	705
September	3.05	3.09	0.17	3.06	2.70	3.77	691
October	3.09	3.14	0.18	3.10	2.66	3.86	693
November	3.17	3.21	0.20	3.17	2.76	4.00	835
December	3.15	3.18	0.20	3.14	2.65	4.14	891
For the Year	3.04	3.08	0.19	3.04	2.56	4.14	9,947

Table A-1 (Continued)

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

2003

Other Solids

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	5.68	5.66	0.09	5.67	4.56	5.84	918
February	5.69	5.66	0.09	5.68	4.89	5.91	908
March	5.69	5.66	0.09	5.68	5.08	5.92	912
April	5.70	5.67	0.09	5.69	5.22	5.93	909
May	5.71	5.68	0.10	5.69	4.96	5.94	903
June	5.71	5.68	0.10	5.69	5.07	5.93	897
July	5.71	5.67	0.10	5.68	5.26	5.95	685
August	5.69	5.65	0.10	5.67	5.08	6.00	705
September	5.68	5.63	0.10	5.65	5.01	5.95	691
October	5.66	5.62	0.10	5.63	4.80	5.85	693
November	5.67	5.63	0.11	5.65	4.70	5.83	835
December	5.67	5.64	0.11	5.66	4.97	5.85	891
For the Year	5.69	5.66	0.10	5.67	4.56	6.00	9,947

Table A-2

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

2003

Butterfat

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	3.68	3.75	0.31	3.70	2.93	5.12	754
February	3.65	3.72	0.30	3.66	2.96	5.03	757
March	3.63	3.69	0.29	3.65	3.12	4.91	759
April	3.61	3.65	0.28	3.61	2.79	4.86	878
May	3.55	3.59	0.27	3.55	2.83	4.75	864
June	3.48	3.50	0.26	3.47	2.69	4.66	860
July	3.46	3.49	0.25	3.46	2.59	4.65	551
August	3.45	3.51	0.27	3.48	2.79	4.80	560
September	3.55	3.64	0.29	3.61	3.08	4.92	527
October	3.60	3.69	0.29	3.66	2.90	4.94	557
November	3.73	3.83	0.32	3.78	2.57	5.30	701
December	3.74	3.81	0.32	3.77	3.03	5.37	731
For the Year	3.60	3.66	0.31	3.62	2.57	5.37	8,499

Protein

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	3.07	3.14	0.19	3.11	2.64	3.99	754
February	3.05	3.11	0.19	3.07	2.68	3.96	757
March	3.05	3.10	0.18	3.07	2.68	3.92	759
April	3.04	3.07	0.17	3.05	2.49	3.90	878
May	2.99	3.03	0.16	3.01	2.52	3.82	864
June	2.97	3.01	0.16	2.99	2.62	3.85	860
July	2.91	2.96	0.15	2.94	2.62	3.59	551
August	2.94	2.99	0.16	2.96	2.66	3.66	560
September	3.03	3.11	0.16	3.08	2.74	3.83	527
October	3.10	3.17	0.17	3.14	2.77	3.92	557
November	3.17	3.24	0.19	3.20	2.60	4.11	701
December	3.16	3.22	0.18	3.19	2.71	4.11	731
For the Year	3.04	3.10	0.19	3.07	2.49	4.11	8,499

Table A-2 (Continued)

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

2003

Other Solids

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	5.68	5.65	0.11	5.66	4.64	5.88	754
February	5.69	5.66	0.10	5.68	4.97	5.91	757
March	5.71	5.68	0.11	5.70	4.94	5.89	759
April	5.70	5.69	0.10	5.70	4.72	5.91	878
May	5.71	5.71	0.10	5.72	4.90	5.94	864
June	5.71	5.70	0.10	5.71	4.88	5.95	860
July	5.71	5.69	0.11	5.70	5.00	5.90	551
August	5.70	5.68	0.11	5.70	5.17	5.92	560
September	5.70	5.67	0.11	5.69	5.16	5.97	527
October	5.69	5.65	0.12	5.67	4.99	5.89	557
November	5.70	5.66	0.13	5.68	4.77	5.87	701
December	5.70	5.67	0.12	5.69	4.69	5.88	731
For the Year	5.70	5.68	0.11	5.69	4.64	5.97	8,499

Table A-3

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

2003

Butterfat

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	3.63	3.67	0.28	3.63	3.14	4.81	109
February	3.58	3.63	0.28	3.59	3.28	4.73	105
March	3.59	3.63	0.29	3.57	3.13	4.84	103
April	3.57	3.60	0.27	3.53	3.17	4.64	107
May	3.54	3.56	0.27	3.51	3.09	4.54	106
June	3.54	3.54	0.28	3.50	3.02	4.70	106
July	3.56	3.56	0.32	3.53	2.38	4.68	107
August	3.54	3.56	0.30	3.52	2.74	4.63	106
September	3.57	3.59	0.31	3.56	2.74	4.91	106
October	3.61	3.65	0.30	3.59	2.98	4.94	104
November	3.69	3.75	0.29	3.69	3.37	4.82	105
December	3.71	3.76	0.31	3.72	3.27	4.84	104
For the Year	3.59	3.62	0.30	3.57	2.38	4.94	1,268

Table A-4

WEIGHTED AVERAGE COMPONENT LEVELS BY REGION
2003

Butterfat

	Region 1	No.*	Region 2	No.*	Region 3	No.*	Region 4	No.*	Region 5	No.*
	-% -		-% -		-% -		-% -		-% -	
January	3.66	450	3.64	107	3.65	52	3.86	13	3.81	272
February	3.64	445	3.62	107	3.66	52	3.80	13	3.80	271
March	3.64	448	3.58	106	3.63	52	3.76	13	3.81	271
April	3.61	445	3.54	106	3.55	52	3.77	13	3.82	271
May	3.57	441	3.50	107	3.53	52	3.73	12	3.80	269
June	3.54	438	3.45	107	3.47	51	3.68	12	3.73	267
July	3.54	435	3.46	49	3.46	51	3.66	12	3.60	120
August	3.53	436	3.42	61	3.42	51	3.66	12	3.60	133
September	3.61	436	3.58	49	3.57	51	3.86	11	3.69	132
October	3.65	437	3.64	49	3.64	52	3.90	11	3.71	132
November	3.76	430	3.78	55	3.80	51	3.99	10	3.95	276
December	3.74	428	3.79	106	3.82	51	3.99	10	3.93	274
For the Year	3.62	5,269	3.59	1,009	3.60	618	3.80	142	3.79	2,688

	Region 6	No.*	Region 7	No.*	Region 8	No.*	Region 9	No.*	Region 10	No.*
	-% -		-% -		-% -		-% -		-% -	
January	4.03	21	3.86	28	3.67	358	3.70	329	3.65	151
February	4.00	20	3.77	28	3.63	361	3.68	326	3.61	147
March	3.89	22	3.72	28	3.60	360	3.64	330	3.61	144
April	3.88	23	3.71	28	3.58	357	3.59	330	3.60	269
May	3.86	22	3.63	27	3.53	360	3.53	324	3.56	259
June	3.78	22	3.53	27	3.46	360	3.45	320	3.53	259
July	3.55	18	3.45	27	3.48	257	3.44	266	3.56	108
August	3.56	18	3.42	27	3.47	260	3.45	267	3.54	106
September	3.70	19	3.54	22	3.57	218	3.53	280	3.57	106
October	3.76	19	3.58	23	3.64	231	3.58	296	3.61	104
November	3.86	20	3.84	24	3.77	325	3.70	342	3.69	108
December	4.09	23	3.91	24	3.75	334	3.71	324	3.72	152
For the Year	3.89	247	3.68	313	3.60	3,781	3.59	3,734	3.60	1,913

Table A-4 (Continued)

WEIGHTED AVERAGE COMPONENT LEVELS BY REGION
2003

Protein

	Region 1	No.*	Region 2	No.*	Region 3	No.*	Region 4	No.*	Region 5	No.*
	-% -		-% -		-% -		-% -		-% -	
January	3.02	450	2.98	107	3.03	52	3.08	13	3.08	272
February	3.01	445	2.96	107	3.00	52	3.04	13	3.07	271
March	3.02	448	2.98	106	3.01	52	3.02	13	3.08	271
April	3.00	445	2.95	106	2.97	52	3.01	13	3.08	271
May	2.97	441	2.92	107	2.95	52	3.01	12	3.08	269
June	2.96	438	2.90	107	2.94	51	3.01	12	3.06	267
July	2.96	435	2.91	49	2.91	51	2.98	12	2.99	120
August	2.98	436	2.92	61	2.94	51	3.00	12	3.02	133
September	3.05	436	3.02	49	3.03	51	3.14	11	3.08	132
October	3.09	437	3.07	49	3.08	52	3.17	11	3.12	132
November	3.15	430	3.16	55	3.19	51	3.23	10	3.21	276
December	3.12	428	3.12	106	3.15	51	3.19	10	3.18	274
For the Year	3.03	5,269	2.98	1,009	3.02	618	3.07	142	3.09	2,688

	Region 6	No.*	Region 7	No.*	Region 8	No.*	Region 9	No.*	Region 10	No.*
	-% -		-% -		-% -		-% -		-% -	
January	3.23	21	3.09	28	3.06	358	3.06	329	N/A	N/A
February	3.23	20	3.05	28	3.04	361	3.04	326	N/A	N/A
March	3.16	22	3.07	28	3.04	360	3.04	330	N/A	N/A
April	3.16	23	3.05	28	3.01	357	3.01	330	N/A	N/A
May	3.18	22	2.99	27	2.97	360	2.98	324	N/A	N/A
June	3.12	22	2.96	27	2.95	360	2.96	320	N/A	N/A
July	2.90	18	2.92	27	2.91	257	2.91	266	N/A	N/A
August	2.94	18	2.95	27	2.95	260	2.93	267	N/A	N/A
September	3.03	19	3.10	22	3.05	218	3.04	280	N/A	N/A
October	3.08	19	3.19	23	3.11	231	3.11	296	N/A	N/A
November	3.12	20	3.26	24	3.20	325	3.16	342	N/A	N/A
December	3.28	23	3.20	24	3.15	334	3.15	324	N/A	N/A
For the Year	3.17	247	3.06	313	3.03	3,781	3.03	3,734	N/A	N/A

Table A-4 (Continued)

WEIGHTED AVERAGE COMPONENT LEVELS BY REGION
2003

Other Solids

	Region 1	No.*	Region 2	No.*	Region 3	No.*	Region 4	No.*	Region 5	No.*
	-% -		-% -		-% -		-% -		-% -	
January	5.67	450	5.66	107	5.68	52	5.65	13	5.71	272
February	5.67	445	5.67	107	5.68	52	5.65	13	5.72	271
March	5.68	448	5.67	106	5.68	52	5.65	13	5.72	271
April	5.68	445	5.68	106	5.69	52	5.65	13	5.73	271
May	5.69	441	5.69	107	5.70	52	5.66	12	5.75	269
June	5.70	438	5.70	107	5.72	51	5.67	12	5.73	267
July	5.69	435	5.73	49	5.71	51	5.67	12	5.74	120
August	5.67	436	5.70	61	5.69	51	5.66	12	5.73	133
September	5.66	436	5.68	49	5.68	51	5.60	11	5.72	132
October	5.64	437	5.67	49	5.67	52	5.60	11	5.69	132
November	5.65	430	5.68	55	5.68	51	5.62	10	5.69	276
December	5.65	428	5.66	106	5.67	51	5.64	10	5.71	274
For the Year	5.67	5,269	5.68	1,009	5.69	618	5.64	142	5.72	2,688

	Region 6	No.*	Region 7	No.*	Region 8	No.*	Region 9	No.*	Region 10	No.*
	-% -		-% -		-% -		-% -		-% -	
January	5.76	21	5.63	28	5.70	358	5.67	329	N/A	N/A
February	5.73	20	5.63	28	5.70	361	5.69	326	N/A	N/A
March	5.76	22	5.66	28	5.72	360	5.72	330	N/A	N/A
April	5.75	23	5.69	28	5.73	357	5.72	330	N/A	N/A
May	5.75	22	5.69	27	5.74	360	5.74	324	N/A	N/A
June	5.74	22	5.71	27	5.73	360	5.74	320	N/A	N/A
July	5.74	18	5.69	27	5.71	257	5.72	266	N/A	N/A
August	5.77	18	5.66	27	5.69	260	5.70	267	N/A	N/A
September	5.76	19	5.63	22	5.69	218	5.71	280	N/A	N/A
October	5.73	19	5.62	23	5.68	231	5.70	296	N/A	N/A
November	5.73	20	5.64	24	5.69	325	5.70	342	N/A	N/A
December	5.72	23	5.66	24	5.71	334	5.71	324	N/A	N/A
For the Year	5.75	247	5.66	313	5.71	3,781	5.71	3,734	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
2003

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

Pacific Northwest Order

	c Constant	b Butterfat Coefficient	Standard Error of b	R-Squared (Adjusted)	Standard Error	Number of Comparisons
January	1.41859	0.43449	0.00962	0.68965	0.10461	918
February	1.47688	0.41742	0.01000	0.65747	0.10596	908
March	1.56877	0.39519	0.01024	0.62049	0.10832	912
April	1.53162	0.40407	0.01028	0.62964	0.10845	909
May	1.42222	0.43524	0.01059	0.65191	0.11078	903
June	1.40030	0.44278	0.01007	0.68311	0.10071	897
July	1.47611	0.41809	0.01319	0.59479	0.10376	685
August	1.48420	0.42294	0.01327	0.59027	0.10696	705
September	1.49364	0.43096	0.01281	0.62104	0.10694	691
October	1.45837	0.44612	0.01263	0.64306	0.10963	693
November	1.60033	0.40766	0.00986	0.67203	0.11231	835
December	1.53968	0.41630	0.01004	0.65898	0.11513	891
For the Year	1.45196	0.43187	0.00310	0.66061	0.11238	9,947

Western Order

	c Constant	b Butterfat Coefficient	Standard Error of b	R-Squared (Adjusted)	Standard Error	Number of Comparisons
January	1.59520	0.41164	0.01652	0.45158	0.13897	754
February	1.56354	0.41651	0.01682	0.44742	0.13795	757
March	1.62357	0.40064	0.01676	0.42929	0.13298	759
April	1.77020	0.35696	0.01577	0.36827	0.13204	878
May	1.75109	0.35729	0.01641	0.35409	0.13055	864
June	1.70628	0.37350	0.01588	0.39116	0.12202	860
July	1.82738	0.32523	0.02084	0.30600	0.12422	551
August	1.73540	0.35818	0.01954	0.37475	0.12262	560
September	1.71624	0.38116	0.01793	0.46164	0.11937	527
October	1.75226	0.38300	0.01875	0.42824	0.12832	557
November	1.65995	0.41249	0.01549	0.50281	0.13171	701
December	1.68268	0.40324	0.01552	0.47997	0.13325	731
For the Year	1.53488	0.42694	0.00479	0.48334	0.13620	8,499

Table A-6

MONTHLY PRODUCER COMPONENT PRICES
2003

Month	Pacific Northwest and Western Order: Butterfat Price $ / pound	Pacific Northwest and Western Order: Protein Price $ / pound	Pacific Northwest and Western Order: Other Solids Price $ / pound	Pacific Northwest Order: Producer Price Differential 1/ $ / hundredweight	Western Order: Producer Price Differential 1/ $ / hundredweight
January	1.1856	1.8164	0.0339	0.98	0.71
February	1.1373	1.8538	0.0240	0.78	0.63
March	1.1459	1.6648	0.0206	1.02	0.77
April	1.1503	1.8006	(0.0008)	0.80	0.54
May	1.1512	1.9275	(0.0144)	0.67	0.48
June	1.1576	1.9434	(0.0200)	0.62	0.49
July	1.2055	2.5480	(0.0124)	(0.85)	(0.34)
August	1.2514	3.1438	0.0026	(2.14)	(1.70)
September	1.2218	3.3180	0.0170	(1.76)	(0.90)
October	1.2553	3.2815	0.0311	(1.34)	(0.63)
November	1.2877	2.9267	0.0368	(0.52)	(0.06)
December	1.3688	2.2997	0.0362	0.60	0.78
Simple Average	1.2099	2.3770	0.0129	(0.10)	0.06

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.

Arizona-Las Vegas Order

Month	Skim Price 2/ $ / hundredweight	Butterfat Price 2/ $ / pound
January	7.05	1.1891
February	6.83	1.1551
March	6.49	1.1493
April	6.54	1.1508
May	6.64	1.1561
June	6.63	1.1622
July	7.59	1.2026
August	8.89	1.2448
September	9.98	1.2431
October	10.29	1.2503
November	9.57	1.2880
December	8.53	1.3579
Simple Average	7.92	1.2124

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
2003

(See Figure A-12)

Pacific Northwest Order

Size Range				
Equal to or more than	Less than	Butterfat	Protein	Other Solids
- pounds -	- pounds -	- % -	- % -	- % -
	50,000	4.06	3.21	5.56
50,000	100,000	3.90	3.14	5.60
100,000	200,000	3.86	3.11	5.63
200,000	300,000	3.80	3.09	5.65
300,000	400,000	3.78	3.08	5.67
400,000	500,000	3.76	3.07	5.67
500,000	600,000	3.71	3.06	5.68
600,000	700,000	3.65	3.03	5.70
700,000	1,000,000	3.62	3.03	5.70
1,000,000	3,000,000	3.60	3.01	5.70
3,000,000		3.65	3.04	5.70
Weighted Average		3.66	3.04	5.69

Western Order

Size Range				
Equal to or more than	Less than	Butterfat	Protein	Other Solids
- pounds -	- pounds -	- % -	- % -	- % -
	50,000	3.71	3.14	5.64
50,000	100,000	3.71	3.15	5.65
100,000	200,000	3.68	3.13	5.68
200,000	300,000	3.63	3.08	5.70
300,000	400,000	3.64	3.07	5.70
400,000	500,000	3.64	3.06	5.69
500,000	600,000	3.54	3.02	5.71
600,000	700,000	3.61	3.04	5.70
700,000	1,000,000	3.59	3.03	5.71
1,000,000	3,000,000	3.60	3.02	5.70
3,000,000		3.58	3.02	5.71
Weighted Average		3.60	3.04	5.70

Table A-7 (Continued)

AGGREGATED COMPONENT TESTS BY SIZE RANGE
PRODUCER MILK DELIVERIES
2003
(See Figure A-12)
Arizona-Las Vegas Order

Size Range		
Equal to or more than	Less than	Butterfat
- pounds -	- pounds -	- % -
	100,000	3.49
100,000	200,000	4.05
200,000	300,000	3.69
300,000	400,000	3.52
400,000	500,000	3.44
500,000	600,000	3.54
600,000	700,000	3.55
700,000	1,000,000	3.60
1,000,000	2,000,000	3.70
2,000,000	3,000,000	3.62
3,000,000	4,000,000	3.62
4,000,000	5,000,000	3.61
5,000,000	6,000,000	3.48
6,000,000	7,000,000	3.53
7,000,000		3.52
Weighted Average		3.59

Table A-8

AGGREGATED COMPONENT VALUES BY SIZE RANGE
PRODUCER MILK DELIVERIES
2003
(See Figure A-13)

Pacific Northwest Order

Size Range					
Equal to or more than	Less than	Aggregated Component Values*	Producer Milk	Percent of Producer Milk	Weighted Average Value
- pounds -	- pounds -	- dollars -	- pounds -	- % -	- dollars/cwt. -
	50,000	$ 1,961,038.80	15,662,512	0.25%	12.52
50,000	100,000	7,748,437.88	63,545,120	1.00%	12.19
100,000	200,000	34,054,526.12	283,957,254	4.49%	11.99
200,000	300,000	41,149,977.57	346,821,477	5.48%	11.86
300,000	400,000	39,299,547.87	332,598,334	5.25%	11.82
400,000	500,000	39,509,756.84	338,589,735	5.35%	11.67
500,000	600,000	34,586,873.78	296,573,351	4.68%	11.66
600,000	700,000	34,529,229.68	299,692,683	4.73%	11.52
700,000	1,000,000	83,632,335.97	727,519,056	11.49%	11.50
1,000,000	3,000,000	275,282,653.66	2,423,248,988	38.28%	11.36
3,000,000		134,646,437.16	1,202,925,295	19.00%	11.19
Total/Weighted Average		$ 726,400,815.32	6,331,133,805	100.00%	11.47

Western Order

Size Range					
Equal to or more than	Less than	Aggregated Component Values*	Producer Milk	Percent of Producer Milk	Weighted Average Value
- pounds -	- pounds -	- dollars -	- pounds -	- % -	- dollars/cwt. -
	50,000	$ 4,313,812.95	34,250,450	0.75%	12.59
50,000	100,000	12,095,855.45	99,960,982	2.18%	12.10
100,000	200,000	30,834,634.22	263,122,551	5.75%	11.72
200,000	300,000	23,381,992.25	202,272,700	4.42%	11.56
300,000	400,000	17,121,685.05	148,776,122	3.25%	11.51
400,000	500,000	18,530,966.47	163,155,028	3.56%	11.36
500,000	600,000	17,717,031.98	160,478,292	3.51%	11.04
600,000	700,000	17,595,455.94	157,372,722	3.44%	11.18
700,000	1,000,000	44,550,651.11	403,059,929	8.80%	11.05
1,000,000	3,000,000	179,542,335.41	1,624,116,186	35.48%	11.05
3,000,000		145,785,100.56	1,321,180,247	28.86%	11.03
Total/Weighted Average		$ 511,469,521.37	4,577,745,209	100.00%	11.17

Table A-8 (Continued)

AGGREGATED COMPONENT VALUES BY SIZE RANGE
PRODUCER MILK DELIVERIES
2003
(See Figure A-13)
Arizona-Las Vegas Order

Size Range					
Equal to or more than	Less than	Aggregated Component Values*	Producer Milk	Percent of Producer Milk	Weighted Average Value
- pounds -	- pounds -	- dollars -	- pounds -	- % -	- dollars/cwt. -
	100,000	$ 155,663.85	1,255,065	0.04%	12.40
100,000	200,000	352,335.82	2,749,087	0.09%	12.82
200,000	300,000	762,143.31	6,266,645	0.20%	12.16
300,000	400,000	1,092,324.17	8,927,609	0.29%	12.24
400,000	500,000	1,759,672.91	14,802,932	0.48%	11.89
500,000	600,000	3,302,777.99	27,113,417	0.89%	12.18
600,000	700,000	2,925,297.31	25,433,989	0.83%	11.50
700,000	1,000,000	13,492,361.05	109,646,237	3.58%	12.31
1,000,000	2,000,000	62,452,426.21	509,432,415	16.64%	12.26
2,000,000	3,000,000	77,515,393.99	657,761,193	21.49%	11.78
3,000,000	4,000,000	41,308,673.59	352,238,615	11.51%	11.73
4,000,000	5,000,000	36,073,691.13	295,218,011	9.64%	12.22
5,000,000	6,000,000	27,696,500.50	235,231,667	7.68%	11.77
6,000,000	7,000,000	16,998,196.96	147,906,117	4.83%	11.49
7,000,000		78,169,313.78	667,215,559	21.80%	11.72
Total/Weighted Average		$ 364,056,772.56	3,061,198,558	100.00%	11.89

* 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
2003

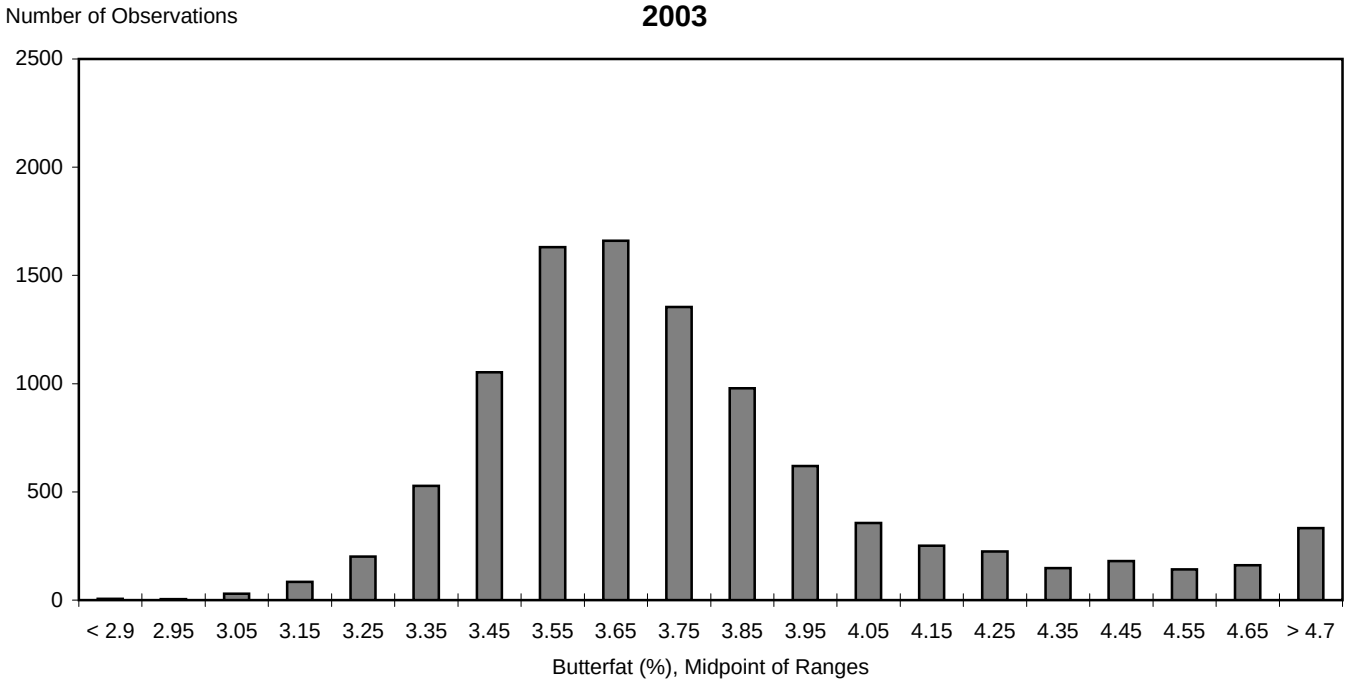


Figure A-2
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE PROTEIN LEVELS
PACIFIC NORTHWEST ORDER
2003

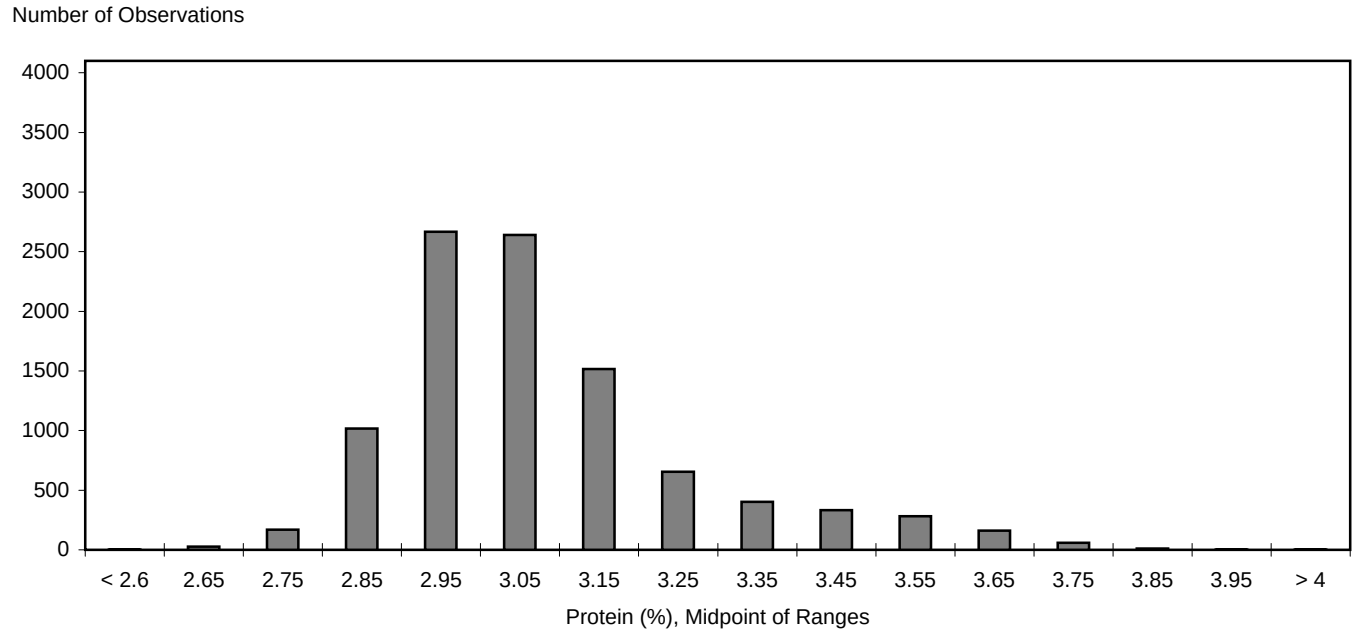


Figure A-3
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE OTHER SOLIDS LEVELS: PACIFIC NORTHWEST ORDER
2003

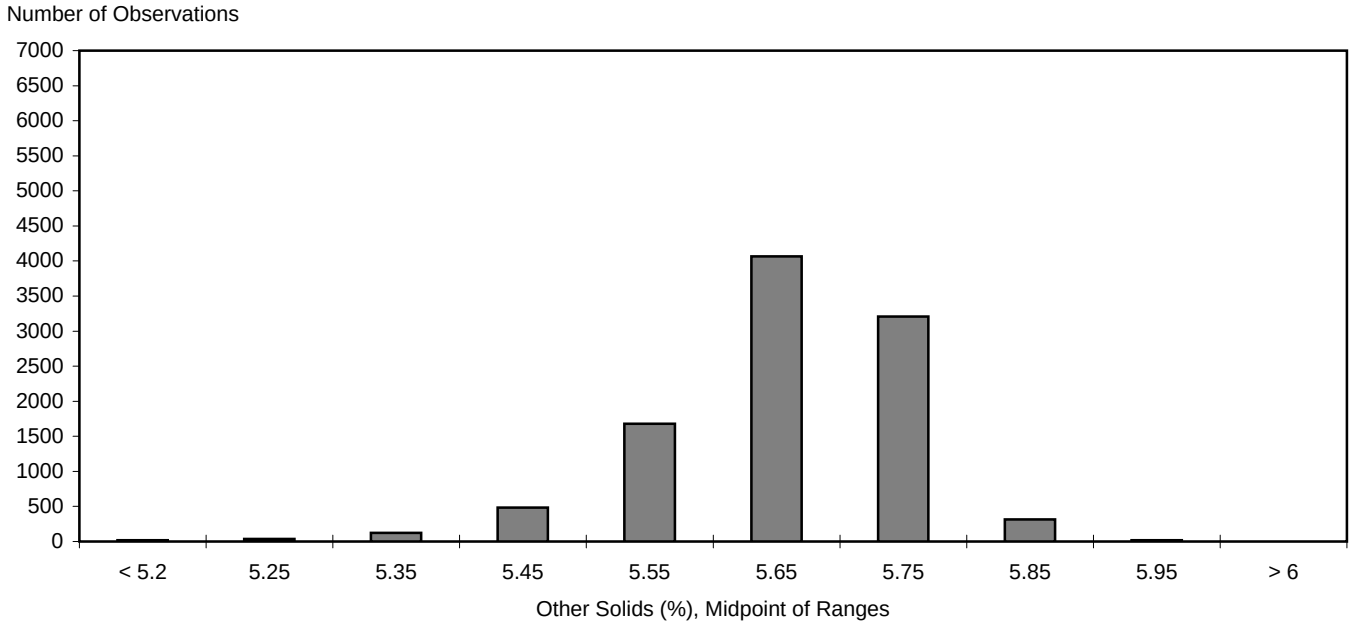


Figure A-4
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE BUTTERFAT LEVELS
WESTERN ORDER
2003

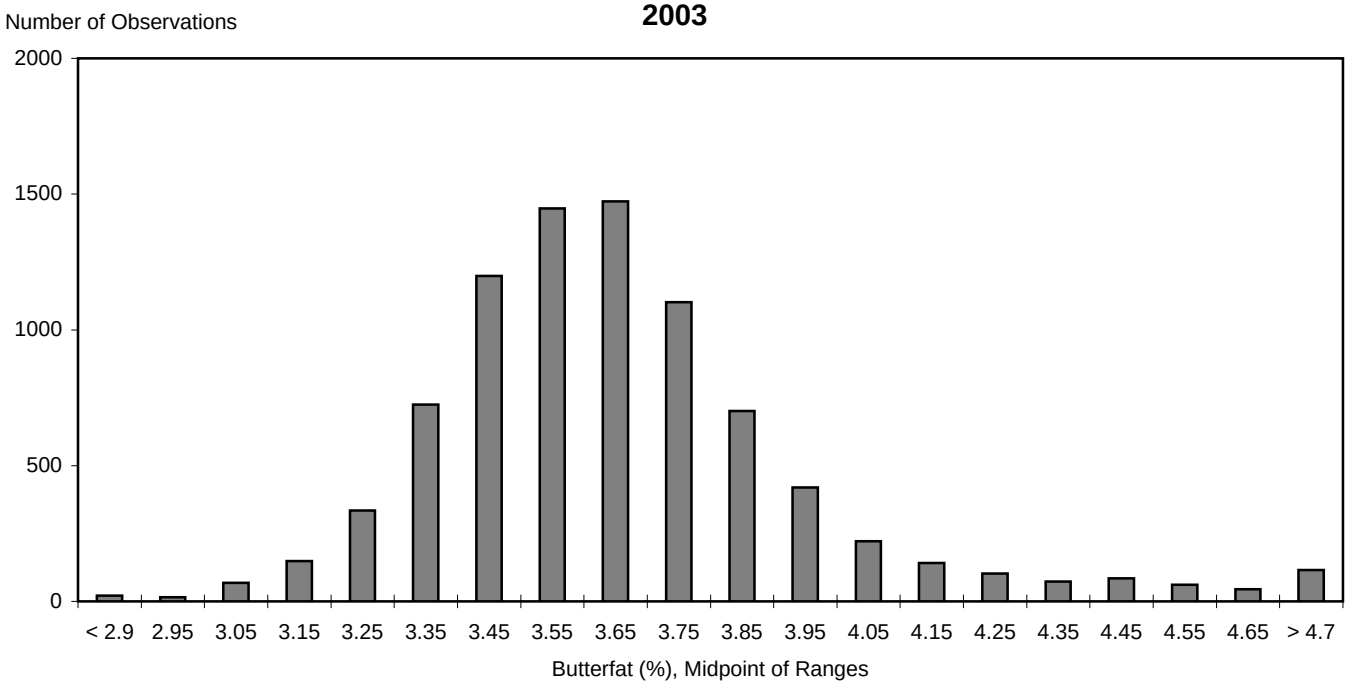


Figure A-5
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE PROTEIN LEVELS
WESTERN ORDER
2003

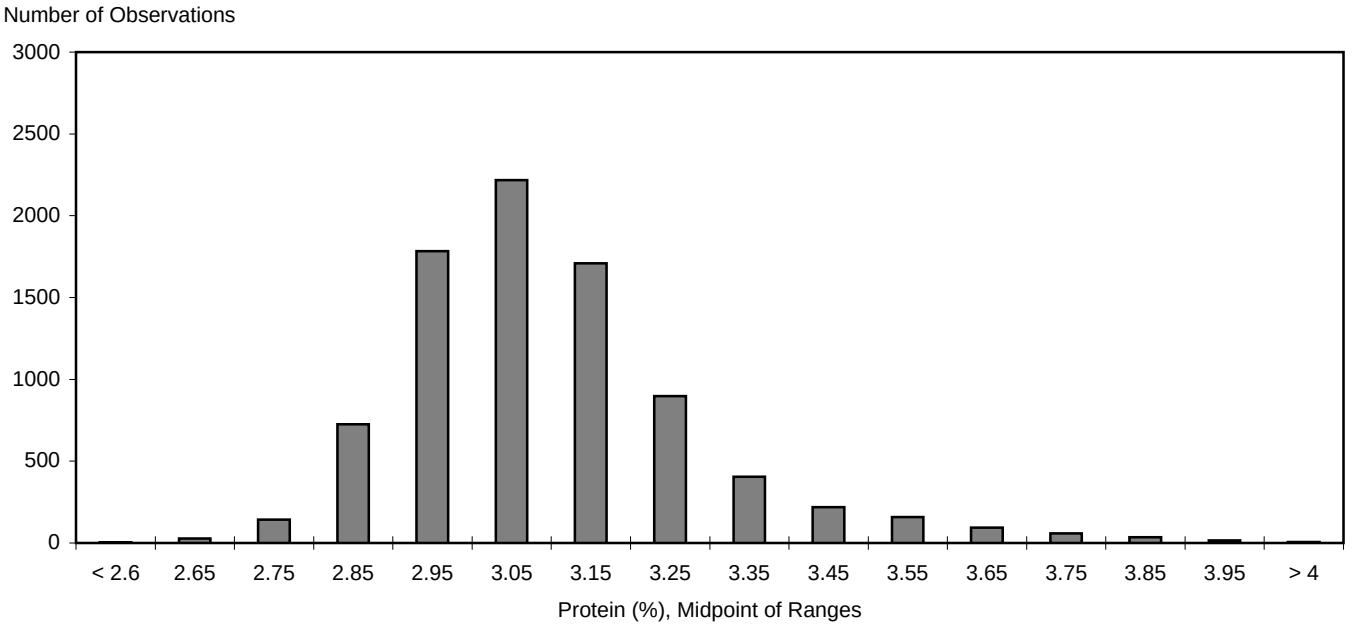


Figure A-6
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE OTHER SOLIDS
LEVELS: WESTERN ORDER
2003

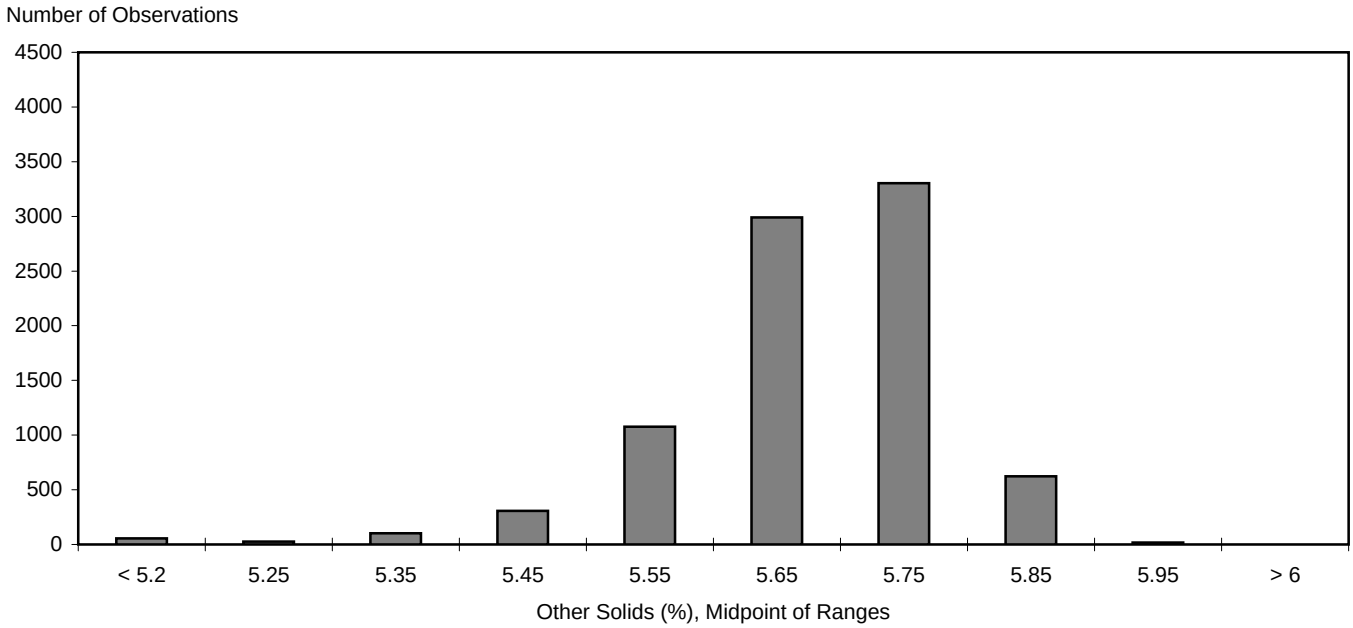


Figure A-7
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE BUTTERFAT LEVELS
ARIZONA-LAS VEGAS ORDER
2003

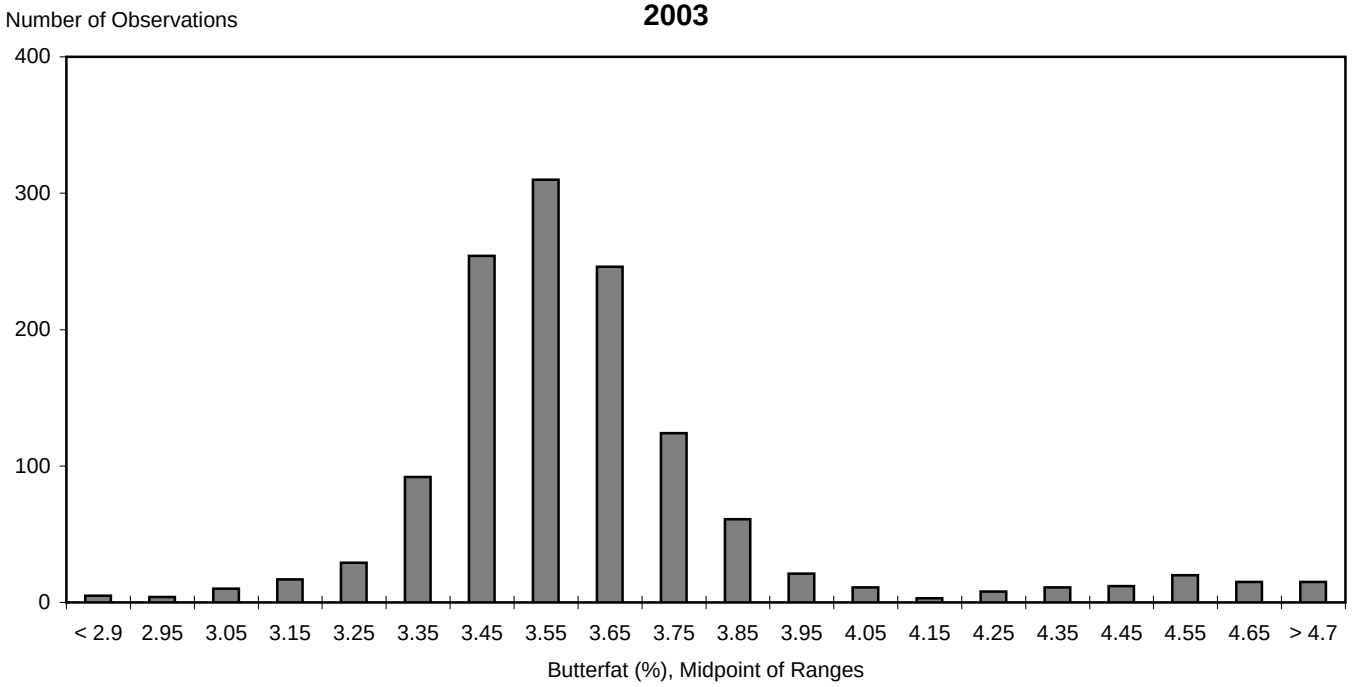
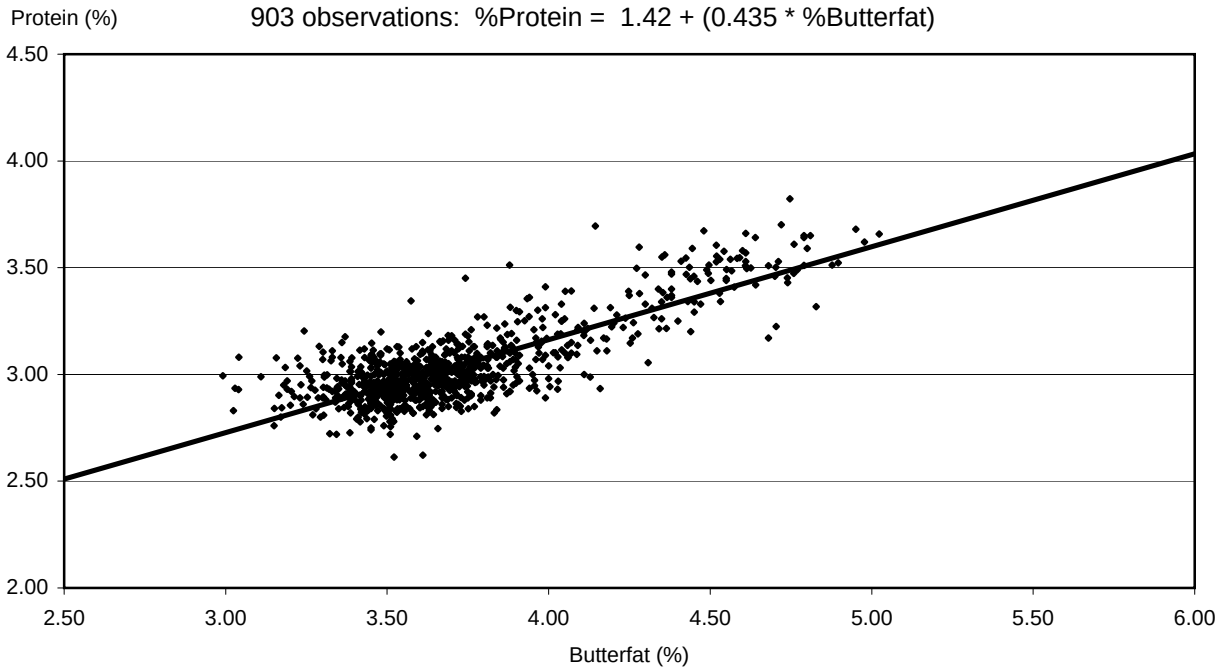


Figure A-8
SCATTER PLOT OF PROTEIN AND BUTTERFAT
MAY AND NOVEMBER 2003
Pacific Northwest Order

May 2003



November 2003

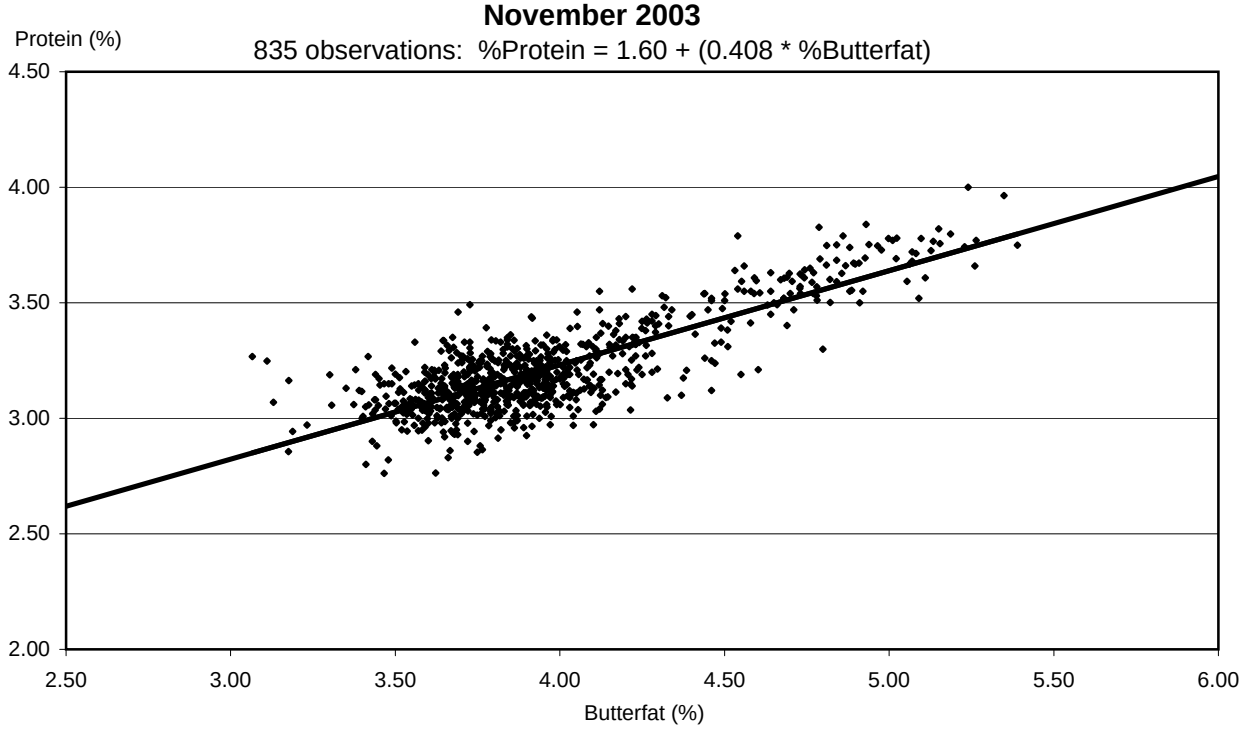
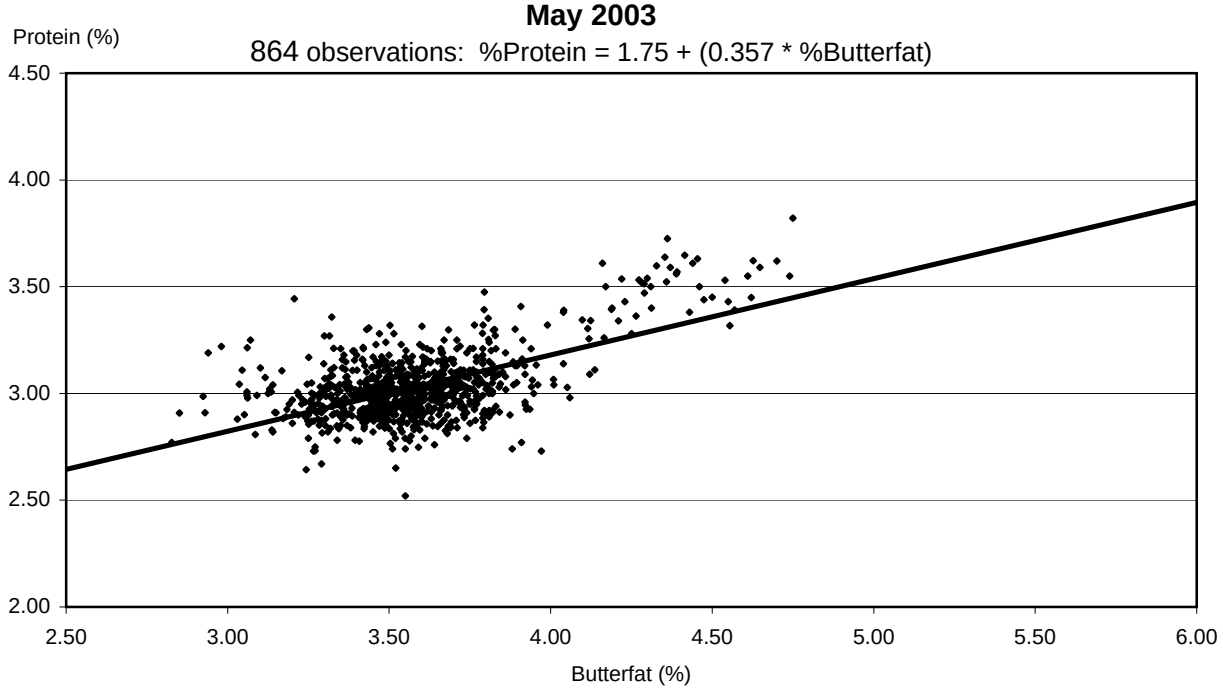


Figure A-9
SCATTER PLOT OF PROTEIN AND BUTTERFAT
MAY AND NOVEMBER 2003
Western Order



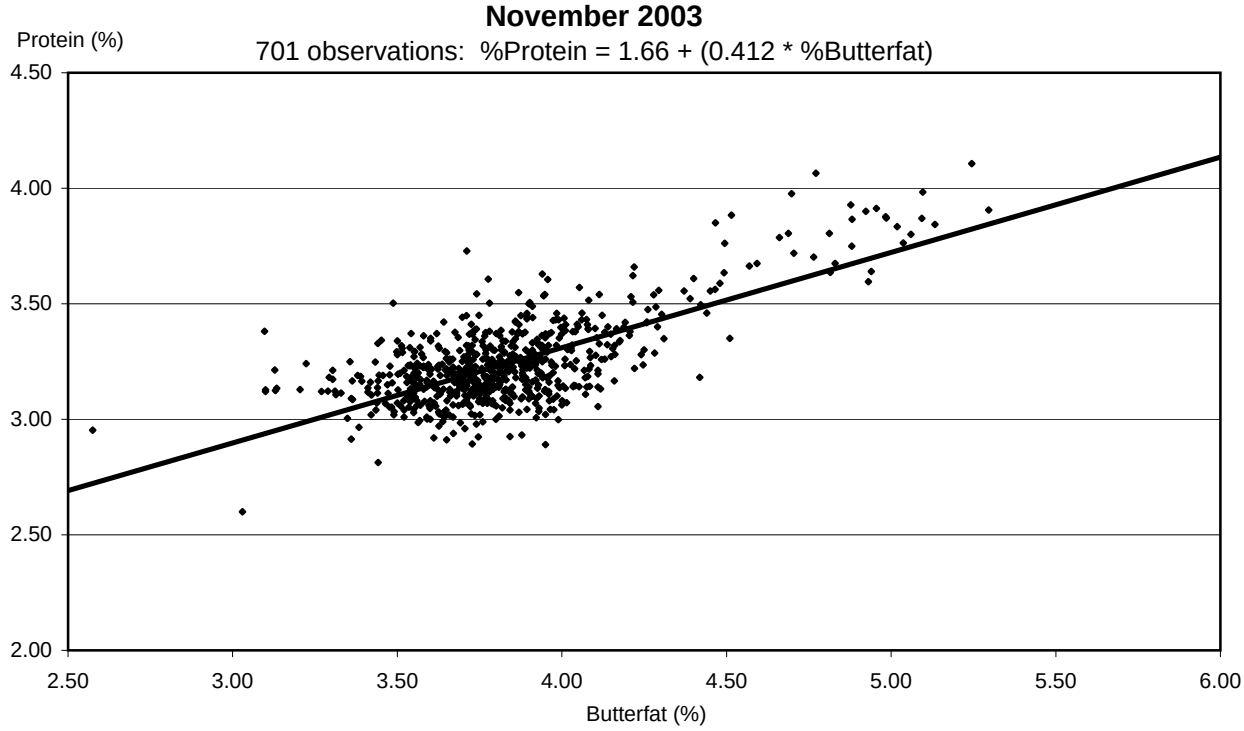
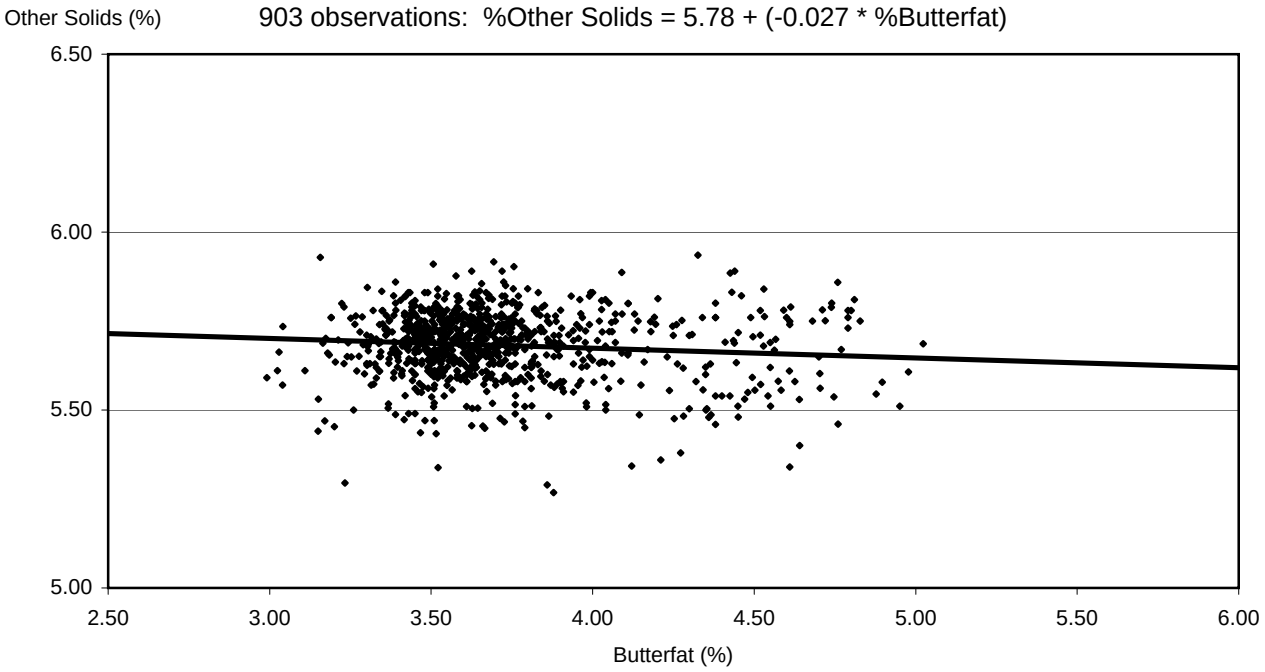


Figure A-10
SCATTER PLOT OF OTHER SOLIDS AND BUTTERFAT
MAY AND NOVEMBER 2003
Pacific Northwest Order

May 2003



November 2003

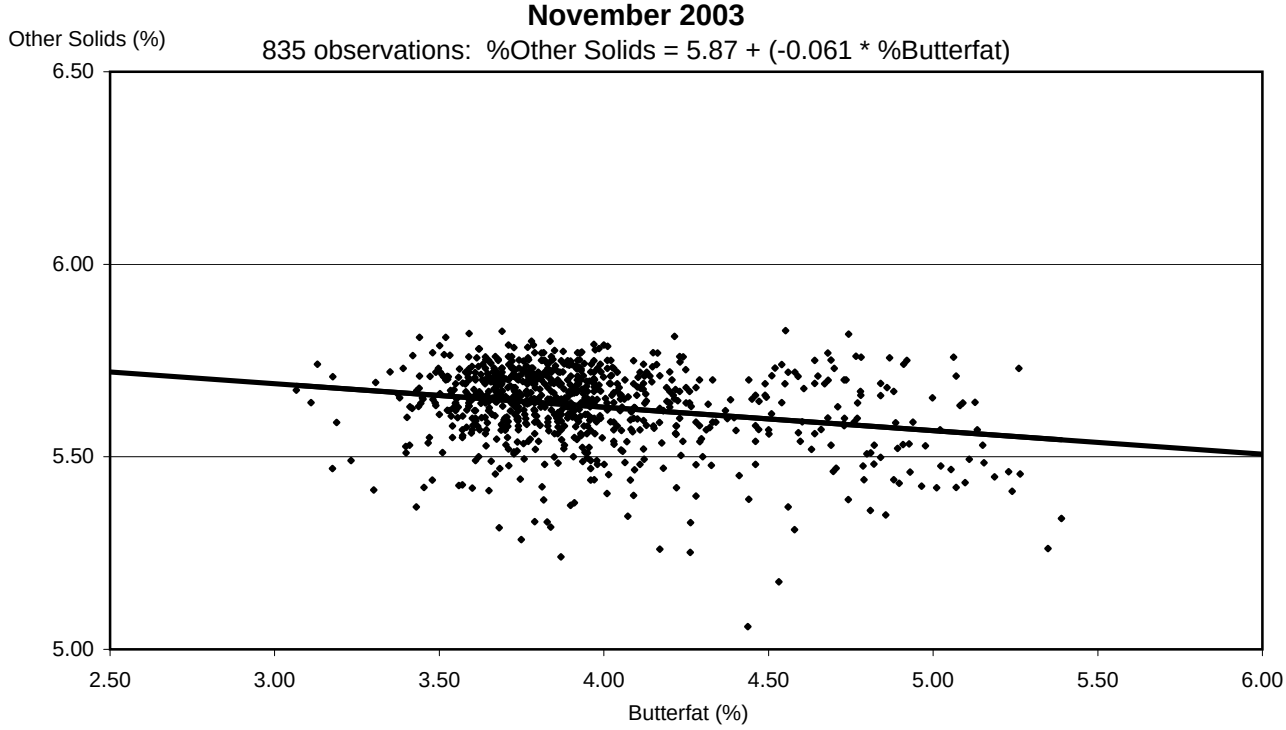
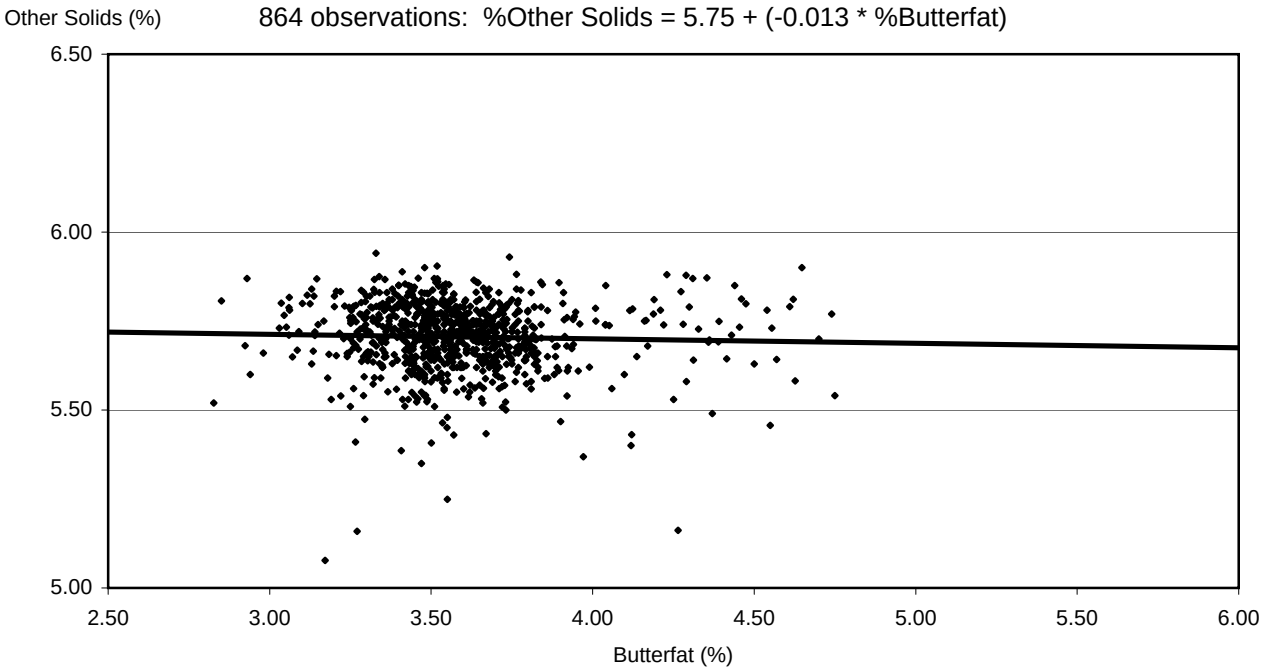


Figure A-11
SCATTER PLOT OF OTHER SOLIDS AND BUTTERFAT
MAY AND NOVEMBER 2003
Western Order

May 2003



November 2003

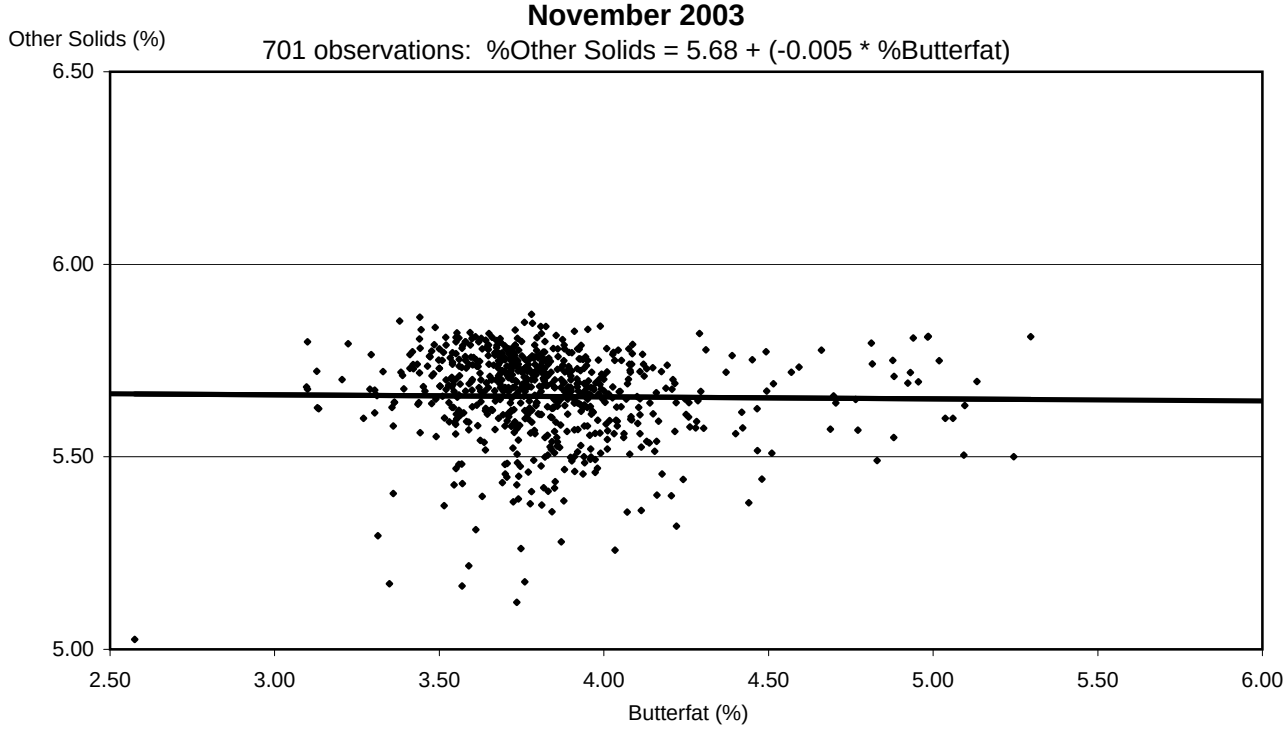
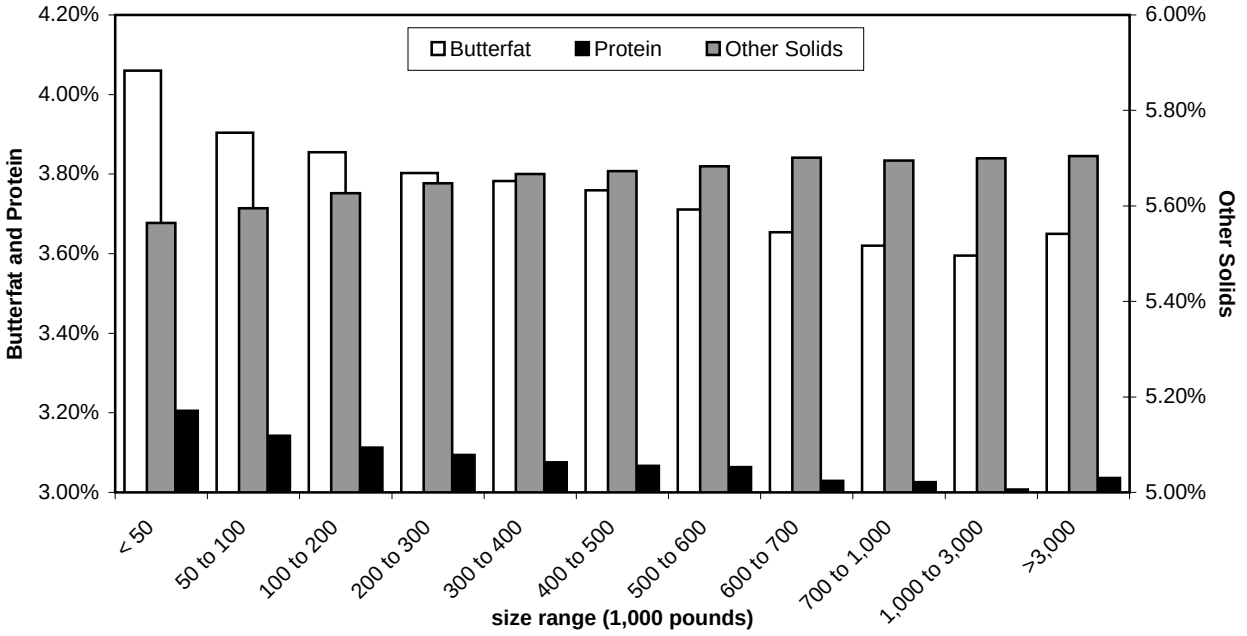


Figure A-12
WEIGHTED AVERAGE COMPONENT LEVELS
BY SIZE RANGE OF PRODUCER MILK DELIVERIES
2003

Pacific Northwest Order



Western Order

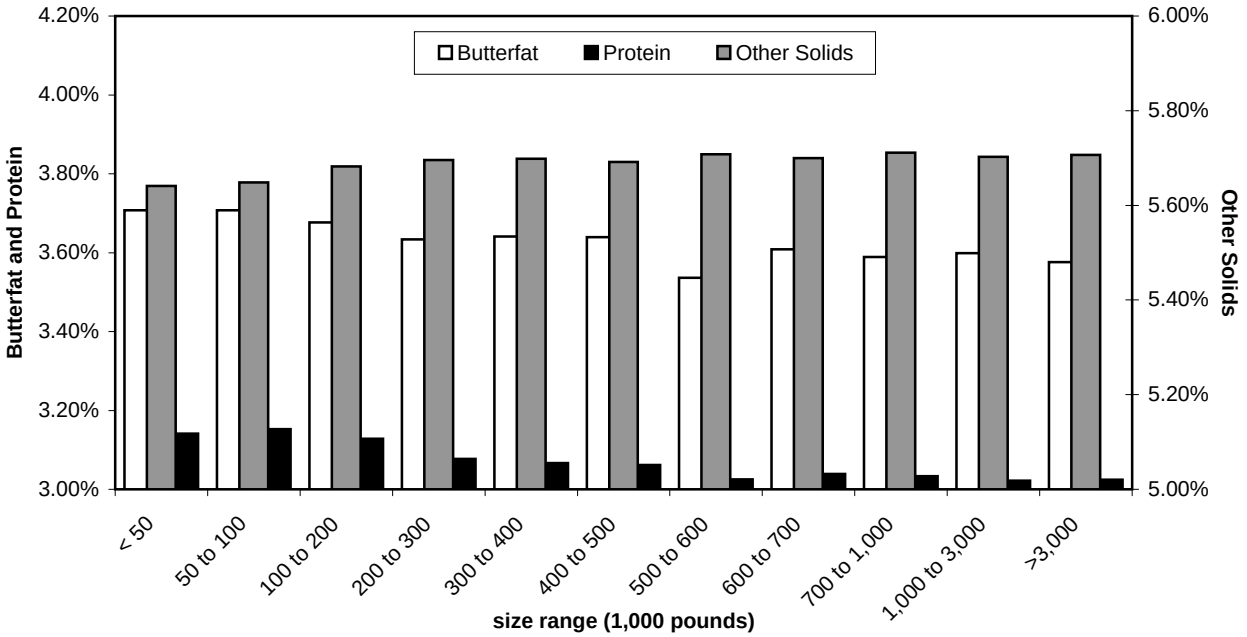


Figure A-12 (continued)
WEIGHTED AVERAGE COMPONENT LEVELS
BY SIZE RANGE OF PRODUCER MILK DELIVERIES
2003

Arizona-Las Vegas Order

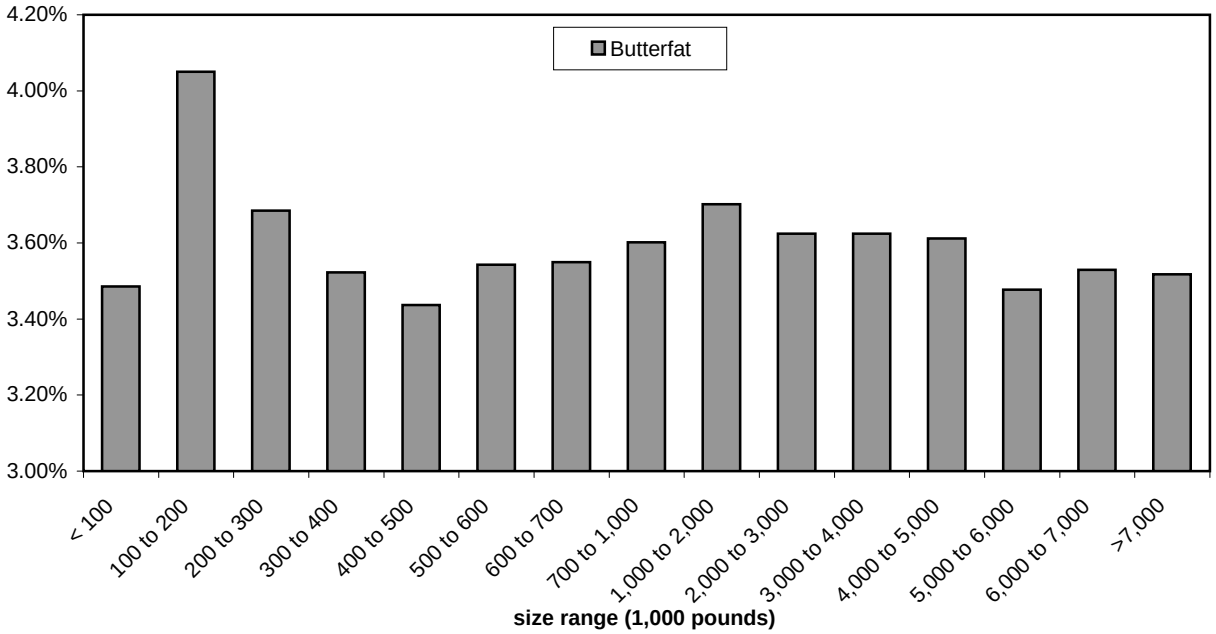
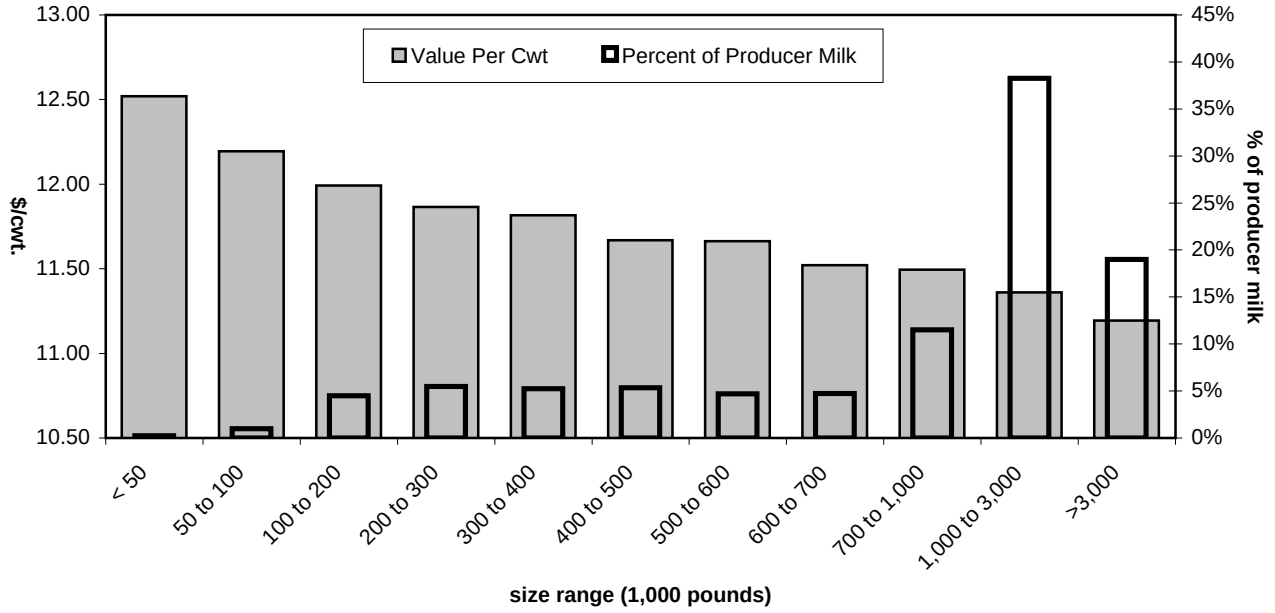


Figure A-13
WEIGHTED AVERAGE VALUES AND PERCENT OF PRODUCER MILK
BY SIZE RANGE OF PRODUCER MILK DELIVERIES
2003

Pacific Northwest Order



Western Order

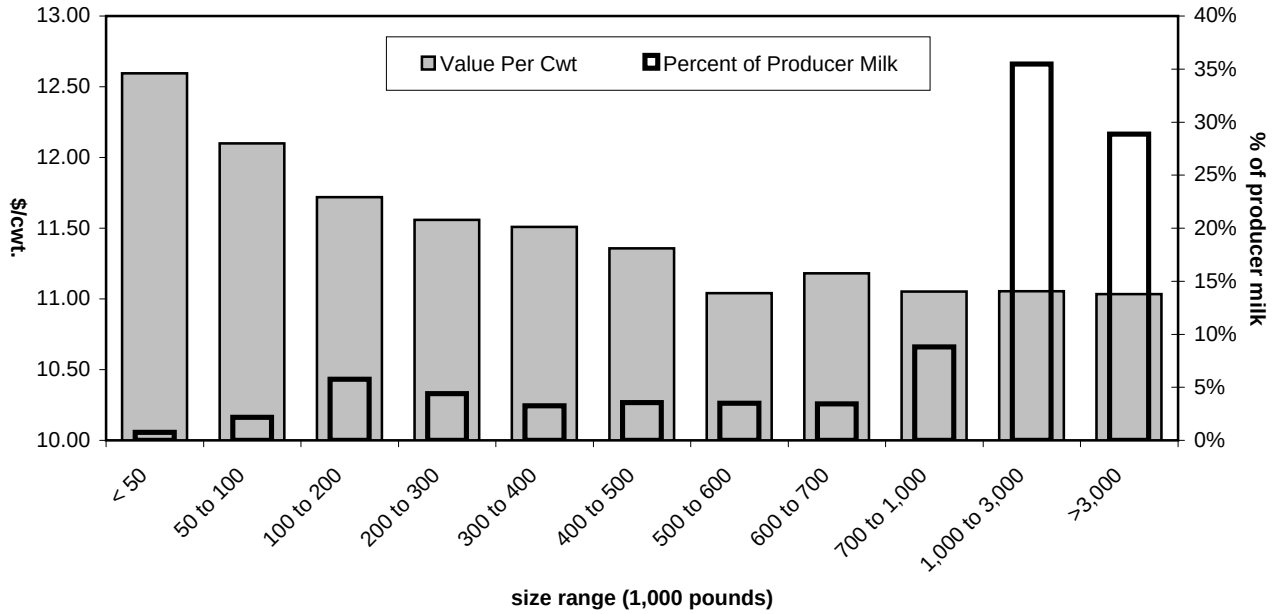
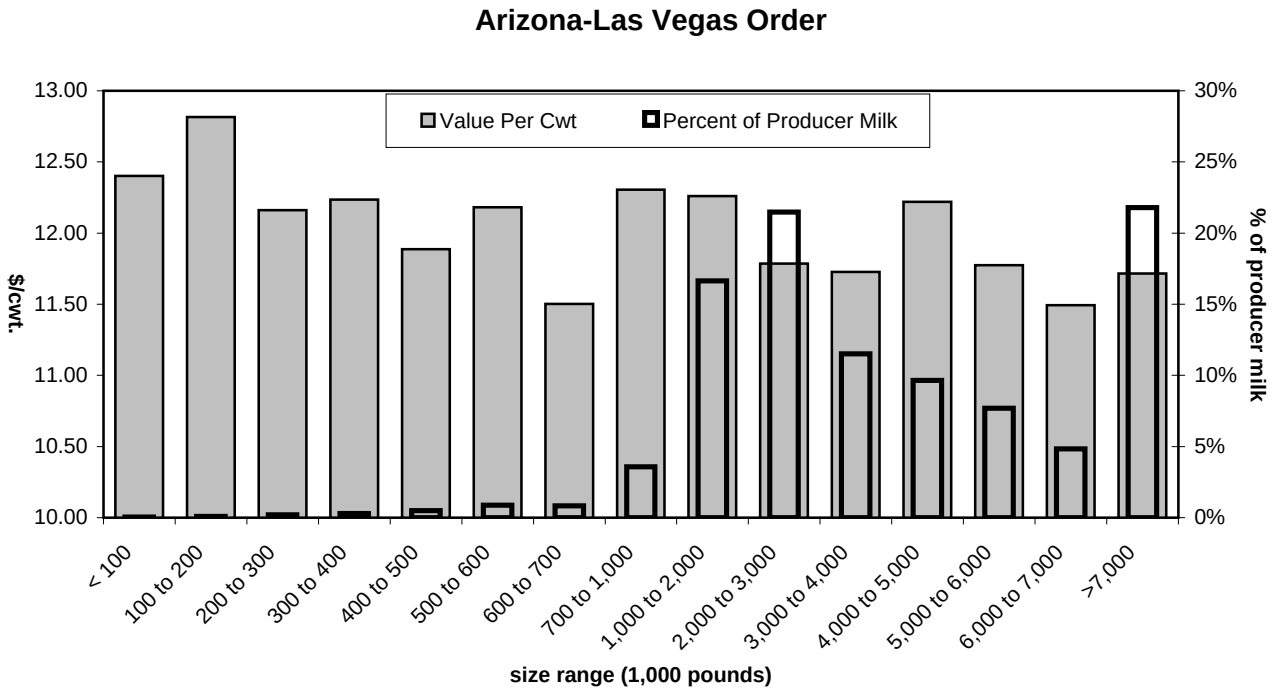
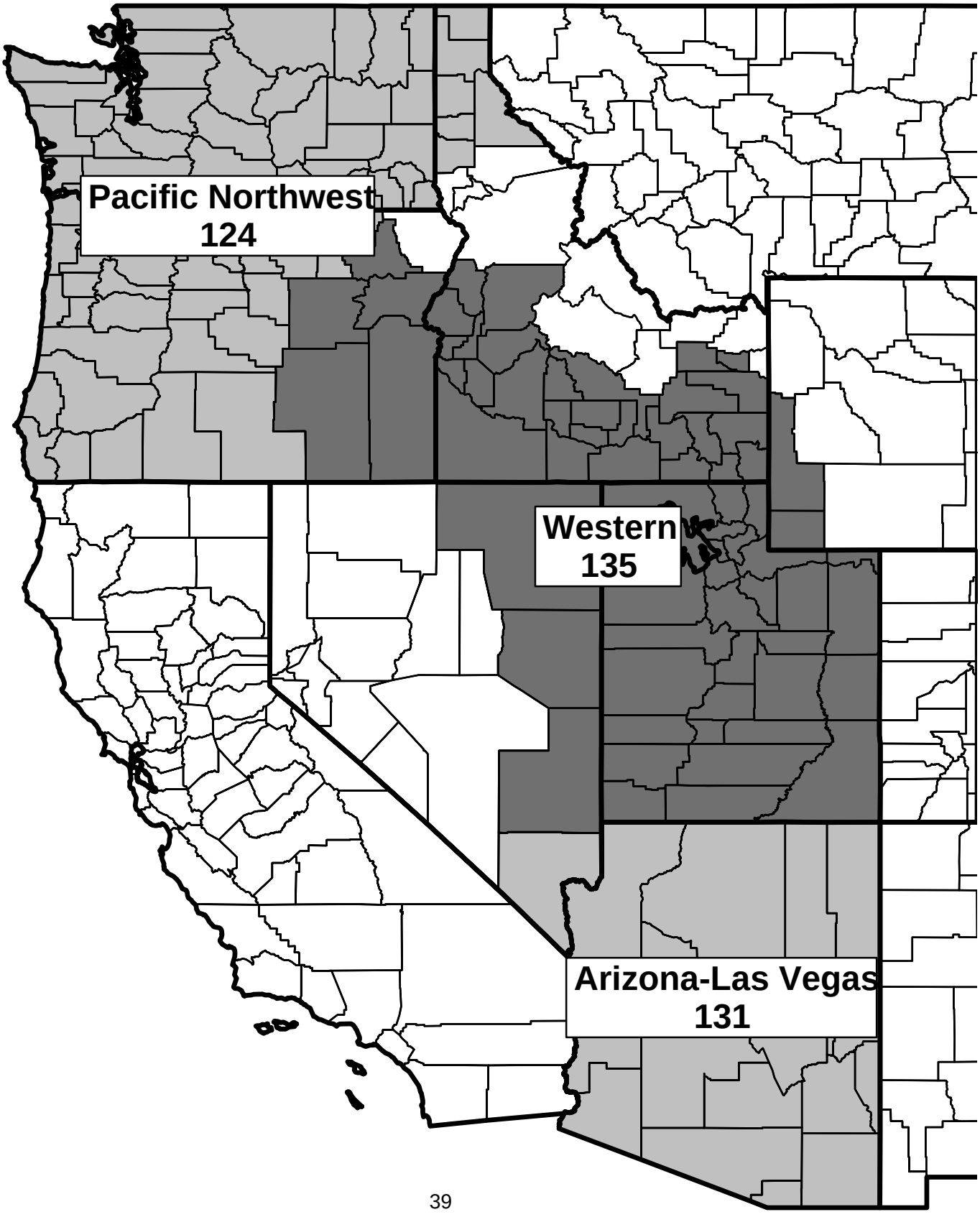


Figure A-13 (continued)
WEIGHTED AVERAGE VALUES AND PERCENT OF PRODUCER MILK
BY SIZE RANGE OF PRODUCER MILK DELIVERIES
2003



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, 2003