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

PACIFIC NORTHWEST AND ARIZONA-LAS VEGAS FEDERAL MILK MARKETING ORDERS

2004

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Abstract

Component levels in producer milk pooled on the Pacific Northwest (FO 124) and Arizona-Las Vegas (FO 131) Federal Milk Marketing Orders were analyzed for 2004 to determine average levels, regional and seasonal variation, and, when possible, the statistical relationship between components. Handlers regulated under the Pacific Northwest Order 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 2004, a monthly average total of 924 producers were pooled on the Pacific Northwest and Arizona-Las Vegas Orders. During 2004, these producers delivered 9.4 billion pounds to the two markets. The milk shed of the two Federal orders includes Arizona, California, Idaho, Oregon, and Washington.

Major findings of this study include:

1. The 2004 average component levels for the Pacific Northwest Order were 3.68% butterfat, 3.05% true protein, and 5.69% other solids. The 2004 average butterfat level for the Arizona-Las Vegas Order was 3.61%.
2. In both 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 two orders.
4. The Pacific Northwest Order's linear regression in 2004 for protein is PRO% = 1.43 + 0.439 * BF%, with an R-squared of 0.65.
5. The Pacific Northwest Order’s regressions for estimating other solids using butterfat have a very poor correlation (R-squared of less than 0.05). The monthly regressions show a negative relationship; other solids levels appear to be independent of butterfat levels.

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2004

Chris Werner [1/]

I. INTRODUCTION

This study examines milk component levels in milk pooled on the Pacific Northwest (FO 124) and Arizona-Las Vegas (FO 131) Milk Marketing Orders during 2004. 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 2004, 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 and Arizona-Las Vegas 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 2004 was valued using Federal order minimum producer prices for the respective orders.

For 2004, a monthly average total of 924 producers were pooled on the Pacific Northwest and Arizona-Las Vegas Orders. During 2004, these producers delivered 9.4 billion pounds to the two markets.

Beginning January 2000, true protein was used as a basis for pricing milk under the Pacific Northwest Order. 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 2004, the Pacific Northwest Order milk shed was comprised of producers located in Washington, Oregon, California, and Idaho. The Arizona-Las Vegas milk shed was comprised of producers located in Arizona and California. The milk shed of the two orders includes various geographic and climatic regions. These regions range from very dry climates (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

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Ocean, 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 and Arizona-Las Vegas Orders. The data was collected from producer payrolls submitted by handlers to the market administrator's office. Components available for the Pacific Northwest Order 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 2004, 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.

The Pacific Northwest and Arizona-Las Vegas Orders were divided into seven regions. (See Map A-2.) These regions are different than previous years' studies due to the termination of the Western Order effective April 1, 2004. The Western Order is not included in this study. 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. The Arizona and 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 and Northern California (Region 5), Central/Eastern Oregon and Southern Idaho (Region 6), Arizona and Southern California (Region 7).

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 was split into Northern and Southern Idaho. Northern Idaho is wetter and more mountainous compared to Southern Idaho. Arizona is very dry year round with much less precipitation and many days with average temperatures much higher than the other regions studied.

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

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

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

III. SEASONAL VARIATION IN MILK COMPONENT LEVELS

In 2004, producers associated with the Pacific Northwest Order delivered 6.5 billion pounds. For 2004, producer milk tested, on average, 3.68% butterfat, 3.05% 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 2004 were the highest in January at 3.82% and lowest in May at 3.57%. The seasonal

Table 1
Monthly Component Levels
Pacific Northwest Order
2004

Month	Butterfat	Protein	Other Solids
	- percent -	- percent -	- percent -
January *	3.82	3.12	5.68
February *	3.75	3.07	5.68
March *	3.71	3.05	5.67
April *	3.63	3.02	5.68
May *	3.57	3.00	5.70
June *	3.59	2.98	5.69
July *	3.59	2.96	5.71
August *	3.60	2.97	5.70
September *	3.68	3.08	5.69
October *	3.72	3.14	5.71
November *	3.79	3.14	5.70
December *	3.71	3.09	5.67
Weighted Average	3.68	3.05	5.69

Table 2 Monthly Component Levels Arizona-Las Vegas Order 2004	
Month	Butterfat - percent -
January	3.67
February	3.61
March	3.54
April	3.51
May	3.52
June	3.55
July	3.59
August	3.57
September	3.63
October	3.67
November	3.73
December	3.70
Weighted Average	3.61

* Eligible milk not pooled.

cycle of protein levels is similar to butterfat but with a lesser degree of variation. Protein levels in 2004 were highest in October and November at 3.14% 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 July and October, a low of 5.67% in March and December, and showed very little seasonality.

In 2004, producers associated with the Arizona-Las Vegas Order delivered 2.9 billion pounds. For 2004, producer milk tested, on average, 3.61% butterfat. Butterfat levels in the Arizona-Las Vegas Order follow a similar seasonal pattern as the Pacific Northwest Order. The butterfat levels decrease in the spring and rise again in the fall. (See Table 2 above.) Butterfat levels in the Arizona-Las Vegas Order in 2004 were highest in November at 3.73% and lowest in April at 3.51%.

For 2004, the monthly and annual weighted average butterfat and protein levels were less than the mean averages for both components. (See Table 3 and 4 and Appendix Tables A-1 and A-2.) This difference in 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 Order, 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.

Table 3 Component Levels: Weighted Average, Mean, Median, Standard Deviation, Minimum, and Maximum Pacific Northwest Order 2004			
	Butterfat	Protein	Other Solids
	%	%	%
Weighted Average	3.68	3.05	5.69
Mean	3.79	3.10	5.66
Median	3.71	3.06	5.67
Standard Deviation	0.37	0.20	0.10
Minimum	2.43	2.36	4.48
Maximum	5.66	4.20	5.94

Table 4 Component Levels: Weighted Average, Mean, Median, Standard Deviation, Minimum, and Maximum Arizona-Las Vegas Order 2004	
	Butterfat
	%
Weighted Average	3.61
Mean	3.64
Median	3.59
Standard Deviation	0.30
Minimum	2.81
Maximum	4.87

During 2004, for the Pacific Northwest Order, producers' individual monthly average butterfat tests ranged from 2.43% to 5.66%; protein tests ranged from 2.36% to 4.20%, and other solids levels ranged from 4.48% to 5.94%. (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 3.42% to 4.16%. Similarly, most protein tests ranged from 2.90% to 3.30%, and most other solids tests ranged from 5.56% to 5.76%. (See Appendix Table A-1 for monthly component statistics.)

In 2004, Arizona-Las Vegas Order producer's butterfat tests ranged from 2.81% to 4.87%. (See Table 4.) Based on the definition of a standard deviation, most producers had butterfat tests ranging from 3.34% to 3.94%. (See Appendix Table A-2 for monthly component statistics.)

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

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 seven regions based on the geographic location of the dairy farms. The seven 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 5, below, provides 2004 milk production, average number of producers, and component tests for each region. In 2004, the region with the most milk

Table 5
Various Statistics by Region For 2004

Region 1 (Western Washington)		**Region 2 (Central Washington)**	
Milk Production	2,686,316,726	Milk Production	1,641,569,052
Average Number of Producers	413	Average Number of Producers	83
Average Pounds Per Producer	542,143	Average Pounds Per Producer	1,654,808
Butterfat Test	3.64%	Butterfat Test	3.61%
Protein Test	3.03%	Protein Test	3.01%
Other Solids Test	5.67%	Other Solids Test	5.68%
Region 3 (Eastern Washington)		**Region 4 (Northern Idaho)**	
Milk Production	386,322,251	Milk Production	16,030,963
Average Number of Producers	48	Average Number of Producers	10
Average Pounds Per Producer	677,223	Average Pounds Per Producer	133,591
Butterfat Test	3.65%	Butterfat Test	3.82%
Protein Test	3.03%	Protein Test	3.10%
Other Solids Test	5.68%	Other Solids Test	5.67%
Region 5 (Western Oregon, Northern California)		**Region 6 (Central/Eastern Oregon, Southern Idaho)**	
Milk Production	1,307,578,583	Milk Production	473,500,236
Average Number of Producers	231	Average Number of Producers	44
Average Pounds Per Producer	471,709	Average Pounds Per Producer	896,781
Butterfat Test	3.81%	Butterfat Test	3.80%
Protein Test	3.13%	Protein Test	3.14%
Other Solids Test	5.73%	Other Solids Test	5.73%
Region 7 (Arizona/Southern California)			
Milk Production	2,901,214,657		
Average Number of Producers	95		
Average Pounds Per Producer	2,553,886		
Butterfat Test	3.61%		
Protein Test	n/a		
Other Solids Test	n/a		

n/a = not applicable

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.

Region 7 represents the Arizona-Las Vegas Order. In general, comparing all the regions, Region 7 had the most milk pooled in 2004, with 2.9 billion pounds, while Region 1 had the most producers (413 producers on average). Average milk production per producer was the highest in Region 7 with an average of 2.6 million pounds per producer for the year. The highest butterfat levels in 2004 were in Region 4 with annual tests of 3.82%, while Regions 2 and 7 had the lowest annual butterfat test of 3.61%. Protein levels in Region 6 (3.14%) and other solids levels in Region 5 and 6 (5.73%) 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 2004, butterfat levels in Regions 4, 5, and 6 were noticeably higher than the other regions, while Regions 1, 2, 3, and 7 were much lower than the other regions. Protein levels in Region 6 were 0.13% higher than Region 2. Other solids levels by region varied only 0.06% between the high and low for the year 2004.

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 Table A-5 and Figures A-6.)

The Pacific Northwest Order had 9,946 observations in 2004. This year's regressions are similar to other Federal order publications[3]. Appendix Figures A-6 and A-7 show graphical representations of the linear regressions for May and November 2004.

The butterfat and protein regression equations for the Pacific Northwest Order were calculated for 2000 through 2004. (See Table 6 on the next page.) Over the 2000 - 2004 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 2004 compared to previous years.

[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.

Table 6
Pacific Northwest Order
Comparison of Regression Results: Butterfat Level as a Predictor of Protein Levels
2000 through 2004

Year	Equation	Correlation
2000	TRUE PRO% = 1.526 + 0.414 BF%	$R^2 = 0.600$
2001	TRUE PRO% = 1.535 + 0.417 BF%	$R^2 = 0.599$
2002	TRUE PRO% = 1.488 + 0.426 BF%	$R^2 = 0.649$
2003	TRUE PRO% = 1.452 + 0.432 BF%	$R^2 = 0.661$
2004	TRUE PRO% = 1.434 + 0.439 BF%	$R^2 = 0.652$

VI. MINIMUM ORDER VALUE OF MILK PRODUCTION

The use of monthly component prices 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 2004 averaged $15.24 per hundredweight. The weighted average value of each component comprising the $15.24 per hundredweight was: $7.46 for butterfat; $7.76 for protein; $0.41 for other solids; and a producer price differential of negative $0.39.[4]

The value of producers' milk at test pooled on the Arizona-Las Vegas Order in 2004 averaged $15.70 per hundredweight. The weighted average value of skim and butterfat portions of the $15.70 per hundredweight was: $7.35 for butterfat; and $8.35 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-7. On the Pacific Northwest Order, 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 Order, 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.

[4] The producer price differentials for the Pacific Northwest Order are subject to applicable location adjustments. The effects of the location adjustments are not dealt with in this study.
[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.

The aggregated value of milk production by size-range of milk production is summarized in Appendix Table A-8 and Figure A-8. For the Pacific Northwest Order, on average, using 2004 Federal order prices, producers with less than 50,000 pounds of production received more per hundredweight, $16.33, than other producers. Producers with more than three million pounds of production averaged the lowest amount per hundredweight, at $14.99. 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 Pacific Northwest Order.

VII. SUMMARY

This paper analyzes milk components associated with the Pacific Northwest and Arizona-Las Vegas Orders. Handlers regulated under the Pacific Northwest Order 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 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 2004 were: 3.68% butterfat, 3.05% protein, and 5.69% other solids. Butterfat percentages peaked in January and reached a low in May. Protein percentages peaked in October and November and reached a low in July. 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 two orders.

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

$$\text{Protein} = 1.4341 + 0.4388 * \text{Butterfat} \qquad (R^2 = 0.6522)$$

In 2004, the Federal order weighted average price received for milk was $15.24 per hundredweight, at test.

The annual average butterfat level for the Arizona-Las Vegas Order in 2004 was 3.61%. Butterfat levels peaked in November and reached a low in April. In 2004, the Federal order weighted average price received for milk was $15.70 per hundredweight, at test.

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

2004

Butterfat

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	3.82	3.93	0.37	3.83	3.17	5.23	881
February	3.75	3.86	0.35	3.77	3.06	5.39	863
March	3.71	3.82	0.35	3.73	2.89	5.10	862
April	3.63	3.72	0.33	3.66	2.43	5.27	692
May	3.57	3.66	0.32	3.60	2.66	5.15	699
June	3.59	3.69	0.33	3.61	2.78	5.05	893
July	3.59	3.67	0.33	3.60	2.89	5.09	897
August	3.60	3.70	0.34	3.62	2.92	5.25	891
September	3.68	3.81	0.36	3.72	2.90	5.36	844
October	3.72	3.85	0.37	3.75	2.68	5.59	889
November	3.79	3.94	0.39	3.84	2.79	5.63	840
December	3.71	3.85	0.36	3.76	2.65	5.66	695
For the Year	3.68	3.79	0.37	3.71	2.43	5.66	9,946

Protein

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	3.12	3.15	0.19	3.11	2.71	4.04	881
February	3.07	3.10	0.18	3.06	2.68	3.87	863
March	3.05	3.08	0.19	3.04	2.36	3.90	862
April	3.02	3.06	0.18	3.02	2.39	3.95	692
May	3.00	3.05	0.18	3.01	2.59	3.90	699
June	2.98	3.04	0.18	3.00	2.69	3.92	893
July	2.96	3.01	0.18	2.97	2.64	3.87	897
August	2.97	3.02	0.18	2.98	2.58	3.90	891
September	3.08	3.14	0.19	3.09	2.73	3.87	844
October	3.14	3.18	0.20	3.13	2.60	3.94	889
November	3.14	3.20	0.21	3.15	2.77	4.16	840
December	3.09	3.14	0.19	3.11	2.78	4.20	695
For the Year	3.05	3.10	0.20	3.06	2.36	4.20	9,946

Table A-1 (Continued)

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

2004

Other Solids

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	5.68	5.65	0.10	5.67	4.98	5.86	881
February	5.68	5.66	0.09	5.67	5.14	5.84	863
March	5.67	5.66	0.09	5.67	5.07	5.85	862
April	5.68	5.65	0.09	5.67	4.96	5.85	692
May	5.70	5.67	0.09	5.69	5.12	5.86	699
June	5.69	5.67	0.09	5.68	4.88	5.92	893
July	5.71	5.68	0.10	5.69	4.61	5.90	897
August	5.70	5.67	0.10	5.68	4.96	5.94	891
September	5.69	5.66	0.11	5.67	5.09	5.88	844
October	5.71	5.67	0.10	5.68	5.03	5.91	889
November	5.70	5.66	0.10	5.68	4.95	5.88	840
December	5.67	5.62	0.12	5.64	4.48	5.88	695
For the Year	5.69	5.66	0.10	5.67	4.48	5.94	9,946

Table A-2

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

2004

Butterfat

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	3.67	3.71	0.29	3.64	3.27	4.83	100
February	3.61	3.65	0.28	3.58	3.22	4.69	101
March	3.54	3.58	0.29	3.53	3.11	4.69	100
April	3.51	3.54	0.29	3.47	3.01	4.62	98
May	3.52	3.53	0.29	3.49	2.81	4.52	93
June	3.55	3.57	0.27	3.52	3.08	4.47	93
July	3.59	3.61	0.28	3.55	3.05	4.66	93
August	3.57	3.59	0.28	3.53	2.99	4.64	93
September	3.63	3.65	0.27	3.60	3.08	4.62	93
October	3.67	3.71	0.28	3.65	3.14	4.63	92
November	3.73	3.78	0.30	3.70	3.24	4.80	90
December	3.70	3.78	0.32	3.70	3.29	4.87	90
For the Year	3.61	3.64	0.30	3.59	2.81	4.87	1,136

Table A-3

WEIGHTED AVERAGE COMPONENT LEVELS BY REGION
2004

Butterfat

	Region 1	No.*	Region 2	No.*	Region 3	No.*	Region 4	No.*
	-% -		-% -		-% -		-% -	
January	3.74	422	3.79	104	3.85	50	3.99	10
February	3.69	417	3.69	104	3.72	50	3.91	10
March	3.66	418	3.63	105	3.64	49	3.86	10
April	3.62	418	3.58	50	3.59	49	3.80	10
May	3.58	415	3.49	50	3.52	47	3.71	10
June	3.57	414	3.51	102	3.53	47	3.71	10
July	3.57	414	3.48	101	3.51	47	3.65	10
August	3.56	410	3.49	101	3.53	48	3.69	10
September	3.65	408	3.58	58	3.65	48	3.82	10
October	3.69	408	3.66	101	3.71	48	3.90	10
November	3.74	406	3.72	59	3.79	48	3.97	10
December	3.69	405	3.70	57	3.74	48	3.89	10
For the Year	3.64	4,955	3.61	992	3.65	579	3.82	120

	Region 5	No.*	Region 6	No.*	Region 7	No.*
	-% -		-% -		-% -	
January	3.93	272	4.02	23	3.67	100
February	3.87	260	3.97	22	3.61	101
March	3.85	261	4.07	19	3.54	100
April	3.67	119	3.67	46	3.51	98
May	3.64	129	3.58	48	3.52	93
June	3.76	269	3.58	51	3.55	93
July	3.73	269	3.69	56	3.59	93
August	3.77	268	3.73	54	3.57	93
September	3.83	268	3.67	52	3.63	93
October	3.84	267	3.80	55	3.67	92
November	3.94	266	3.80	51	3.73	90
December	3.74	124	3.82	51	3.70	90
For the Year	3.81	2,772	3.80	528	3.61	1,136

Table A-3 (Continued)

WEIGHTED AVERAGE COMPONENT LEVELS BY REGION
2004

Protein

	Region 1	No.*	Region 2	No.*	Region 3	No.*	Region 4	No.*
	-% -		-% -		-% -		-% -	
January	3.09	422	3.09	104	3.13	50	3.15	10
February	3.04	417	3.03	104	3.06	50	3.09	10
March	3.02	418	3.00	105	3.01	49	3.05	10
April	3.01	418	3.00	50	2.99	49	3.03	10
May	2.99	415	3.00	50	2.98	47	3.06	10
June	2.98	414	2.93	102	2.96	47	3.04	10
July	2.95	414	2.88	101	2.90	47	3.00	10
August	2.95	410	2.90	101	2.92	48	3.03	10
September	3.06	408	3.05	58	3.06	48	3.16	10
October	3.10	408	3.10	101	3.11	48	3.21	10
November	3.11	406	3.13	59	3.14	48	3.25	10
December	3.07	405	3.10	57	3.11	48	3.21	10
For the Year	3.03	4,955	3.01	992	3.03	579	3.10	120

	Region 5	No.*	Region 6	No.*	Region 7	No.*
	-% -		-% -		-% -	
January	3.17	272	3.25	23	N/A	N/A
February	3.13	260	3.19	22	N/A	N/A
March	3.12	261	3.24	19	N/A	N/A
April	3.06	119	3.01	46	N/A	N/A
May	3.05	129	2.99	48	N/A	N/A
June	3.08	269	2.97	51	N/A	N/A
July	3.06	269	3.03	56	N/A	N/A
August	3.08	268	3.10	54	N/A	N/A
September	3.17	268	3.08	52	N/A	N/A
October	3.20	267	3.27	55	N/A	N/A
November	3.22	266	3.16	51	N/A	N/A
December	3.14	124	3.14	51	N/A	N/A
For the Year	3.13	2,772	3.14	528	N/A	N/A

Table A-3 (Continued)

WEIGHTED AVERAGE COMPONENT LEVELS BY REGION
2004

Other Solids

	Region 1	No.*	Region 2	No.*	Region 3	No.*	Region 4	No.*
	-% -		-% -		-% -		-% -	
January	5.66	422	5.66	104	5.66	50	5.66	10
February	5.66	417	5.66	104	5.66	50	5.66	10
March	5.66	418	5.65	105	5.65	49	5.66	10
April	5.67	418	5.70	50	5.67	49	5.68	10
May	5.68	415	5.72	50	5.69	47	5.69	10
June	5.67	414	5.69	102	5.69	47	5.69	10
July	5.69	414	5.71	101	5.70	47	5.70	10
August	5.67	410	5.69	101	5.68	48	5.69	10
September	5.66	408	5.70	58	5.68	48	5.67	10
October	5.68	408	5.70	101	5.70	48	5.68	10
November	5.68	406	5.71	59	5.70	48	5.66	10
December	5.65	405	5.67	57	5.67	48	5.63	10
For the Year	5.67	4,955	5.68	992	5.68	579	5.67	120

	Region 5	No.*	Region 6	No.*	Region 7	No.*
	-% -		-% -		-% -	
January	5.71	272	5.71	23	N/A	N/A
February	5.71	260	5.72	22	N/A	N/A
March	5.72	261	5.73	19	N/A	N/A
April	5.72	119	5.71	46	N/A	N/A
May	5.73	129	5.72	48	N/A	N/A
June	5.74	269	5.72	51	N/A	N/A
July	5.75	269	5.75	56	N/A	N/A
August	5.75	268	5.76	54	N/A	N/A
September	5.74	268	5.71	52	N/A	N/A
October	5.74	267	5.76	55	N/A	N/A
November	5.71	266	5.71	51	N/A	N/A
December	5.70	124	5.68	51	N/A	N/A
For the Year	5.73	2,772	5.73	528	N/A	N/A

* Number of producers included in monthly average component level.
N/A = not applicable, Arizona-Las Vegas Order, Area 7, did not use protein and other solids.

Table A-4

LINEAR RELATIONSHIPS BETWEEN VARIOUS MILK COMPONENTS
2004

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

Pacific Northwest Order

	c	b				
	Constant	Butterfat Coefficient	Standard Error of b	R-Squared (Adjusted)	Standard Error	Number of Comparisons
January	1.48811	0.42294	0.01056	0.64578	0.11582	881
February	1.50732	0.41336	0.01081	0.62894	0.11250	863
March	1.46269	0.42445	0.01111	0.62864	0.11416	862
April	1.52355	0.41258	0.01349	0.57493	0.11533	692
May	1.51296	0.41938	0.01327	0.58852	0.11233	699
June	1.41718	0.44018	0.01070	0.65482	0.10695	893
July	1.33992	0.45540	0.01090	0.66049	0.10776	897
August	1.38567	0.44286	0.01048	0.66719	0.10598	891
September	1.53986	0.41861	0.01054	0.65166	0.10975	844
October	1.52865	0.42912	0.01064	0.64655	0.11660	889
November	1.46926	0.43926	0.01042	0.67903	0.11844	840
December	1.56917	0.40912	0.01270	0.59891	0.11984	695
For the Year	1.43414	0.43877	0.00321	0.65216	0.11659	9,946

Table A-5

LINEAR RELATIONSHIPS BETWEEN VARIOUS MILK COMPONENTS
2004

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

Pacific Northwest Order

	c Constant	b Butterfat Coefficient	Standard Error of b	R-Squared (Adjusted)	Standard Error	Number of Comparisons
January	5.86825	-0.05557	0.00884	0.04194	0.09697	881
February	5.82444	-0.04383	0.00866	0.02779	0.09007	863
March	5.71950	-0.01668	0.00903	0.00280	0.09276	862
April	5.87899	-0.06111	0.01077	0.04319	0.09209	692
May	5.88326	-0.05833	0.01042	0.04161	0.08827	699
June	5.76563	-0.02594	0.00943	0.00732	0.09424	893
July	5.79534	-0.03120	0.00979	0.01013	0.09670	897
August	5.73224	-0.01679	0.00994	0.00208	0.10046	891
September	5.78067	-0.03249	0.01023	0.01066	0.10658	844
October	5.88266	-0.05622	0.00938	0.03782	0.10277	889
November	5.94361	-0.07257	0.00868	0.07581	0.09869	840
December	6.11127	-0.12711	0.01135	0.15207	0.10706	695
For the Year	5.85460	-0.05143	0.00272	0.03473	0.09852	9,946

Table A-6

MONTHLY PRODUCER COMPONENT PRICES
2004

Pacific Northwest Order

Month	Butterfat Price $ / pound	Protein Price $ / pound	Other Solids Price $ / pound	Producer Price Differential 1/ $ / hundredweight
January	1.4978	2.0875	0.0217	0.46
February	1.8518	1.7911	0.0090	0.78
March	2.3813	2.0133	0.0234	0.06
April	2.5013	3.4465	0.1042	(4.32)
May	2.4282	3.7639	0.1444	(3.18)
June	2.1768	3.1086	0.1339	(0.23)
July	2.0543	2.3625	0.1048	0.89
August	1.7941	2.4663	0.0676	0.11
September	1.9354	2.5431	0.0589	(0.28)
October	1.9020	2.3814	0.0677	0.24
November	2.0489	2.4297	0.0800	(0.14)
December	2.0366	2.8486	0.0858	(1.31)
Simple Average	2.0507	2.6035	0.0751	(0.58)

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	7.49	1.4737
February	6.84	1.7983
March	6.96	2.2768
April	8.99	2.4614
May	11.23	2.4363
June	10.54	2.2291
July	9.27	2.0710
August	8.34	1.8615
September	8.79	1.9128
October	8.65	1.9025
November	8.38	2.0316
December	8.81	2.0132
Simple Average	8.69	2.0390

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
2004
(See Figure A-7)
Pacific Northwest Order

Size Range				
Equal to or more than	Less than	Butterfat	Protein	Other Solids
- pounds -	- pounds -	- % -	- % -	- % -
	50,000	4.05	3.20	5.55
50,000	100,000	3.93	3.17	5.61
100,000	200,000	3.86	3.13	5.63
200,000	300,000	3.84	3.12	5.66
300,000	400,000	3.79	3.09	5.67
400,000	500,000	3.78	3.08	5.69
500,000	600,000	3.75	3.09	5.69
600,000	700,000	3.73	3.05	5.69
700,000	1,000,000	3.66	3.04	5.70
1,000,000	3,000,000	3.62	3.02	5.70
3,000,000		3.63	3.04	5.70
Weighted Average		3.68	3.05	5.69

Table A-7 (Continued)

AGGREGATED COMPONENT TESTS BY SIZE RANGE
PRODUCER MILK DELIVERIES
2004
(See Figure A-7)
Arizona-Las Vegas Order

Size Range		
Equal to or more than	Less than	Butterfat
- pounds -	- pounds -	- % -
	100,000	3.57
100,000	200,000	4.13
200,000	300,000	3.68
300,000	400,000	3.38
400,000	500,000	3.60
500,000	600,000	3.49
600,000	700,000	3.56
700,000	1,000,000	3.54
1,000,000	2,000,000	3.70
2,000,000	3,000,000	3.69
3,000,000	4,000,000	3.65
4,000,000	5,000,000	3.69
5,000,000	6,000,000	3.47
6,000,000	7,000,000	3.56
7,000,000		3.49
Weighted Average		3.61

Table A-8

AGGREGATED COMPONENT VALUES BY SIZE RANGE
PRODUCER MILK DELIVERIES
2004
(See Figure A-8)
Pacific Northwest Order

Size Range					
Equal to or more than - pounds -	Less than - pounds -	Aggregated Component Values* - dollars -	Producer Milk - pounds -	Percent of Producer Milk - % -	Weighted Average Value - dollars/cwt. -
	50,000	$ 2,719,340.17	16,656,260	0.26%	16.33
50,000	100,000	10,337,646.15	64,605,170	0.99%	16.00
100,000	200,000	45,634,882.04	287,773,822	4.42%	15.86
200,000	300,000	55,449,261.20	351,757,002	5.40%	15.76
300,000	400,000	48,751,556.20	313,430,425	4.81%	15.55
400,000	500,000	45,729,021.55	294,937,206	4.53%	15.50
500,000	600,000	45,243,785.54	288,789,968	4.44%	15.67
600,000	700,000	45,460,206.59	298,229,391	4.58%	15.24
700,000	1,000,000	117,467,475.80	771,784,191	11.85%	15.22
1,000,000	3,000,000	358,320,563.17	2,373,844,137	36.46%	15.09
3,000,000		217,332,735.95	1,449,510,239	22.26%	14.99
Total/Weighted Average		$ 992,446,474.36	6,511,317,811	100.00%	15.24

Table A-8 (Continued)

AGGREGATED COMPONENT VALUES BY SIZE RANGE
PRODUCER MILK DELIVERIES
2004
(See Figure A-8)
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	$ 169,636.94	1,102,279	0.04%	15.39
100,000	200,000	576,903.19	3,357,864	0.12%	17.18
200,000	300,000	967,625.69	6,518,115	0.22%	14.85
300,000	400,000	850,838.37	5,280,279	0.18%	16.11
400,000	500,000	336,470.42	2,245,792	0.08%	14.98
500,000	600,000	3,033,645.56	19,821,391	0.68%	15.30
600,000	700,000	4,428,630.81	27,792,772	0.96%	15.93
700,000	1,000,000	11,190,878.26	72,767,197	2.51%	15.38
1,000,000	2,000,000	81,629,492.42	516,292,471	17.80%	15.81
2,000,000	3,000,000	82,626,863.06	518,831,413	17.88%	15.93
3,000,000	4,000,000	59,793,388.39	379,618,386	13.08%	15.75
4,000,000	5,000,000	48,057,666.70	302,154,262	10.41%	15.91
5,000,000	6,000,000	39,543,255.79	259,249,316	8.94%	15.25
6,000,000	7,000,000	14,361,701.92	88,798,546	3.06%	16.17
7,000,000		107,924,022.85	697,384,574	24.04%	15.48
Total/Weighted Average		$ 455,491,020.38	2,901,214,657	100.00%	15.70

* 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
2004

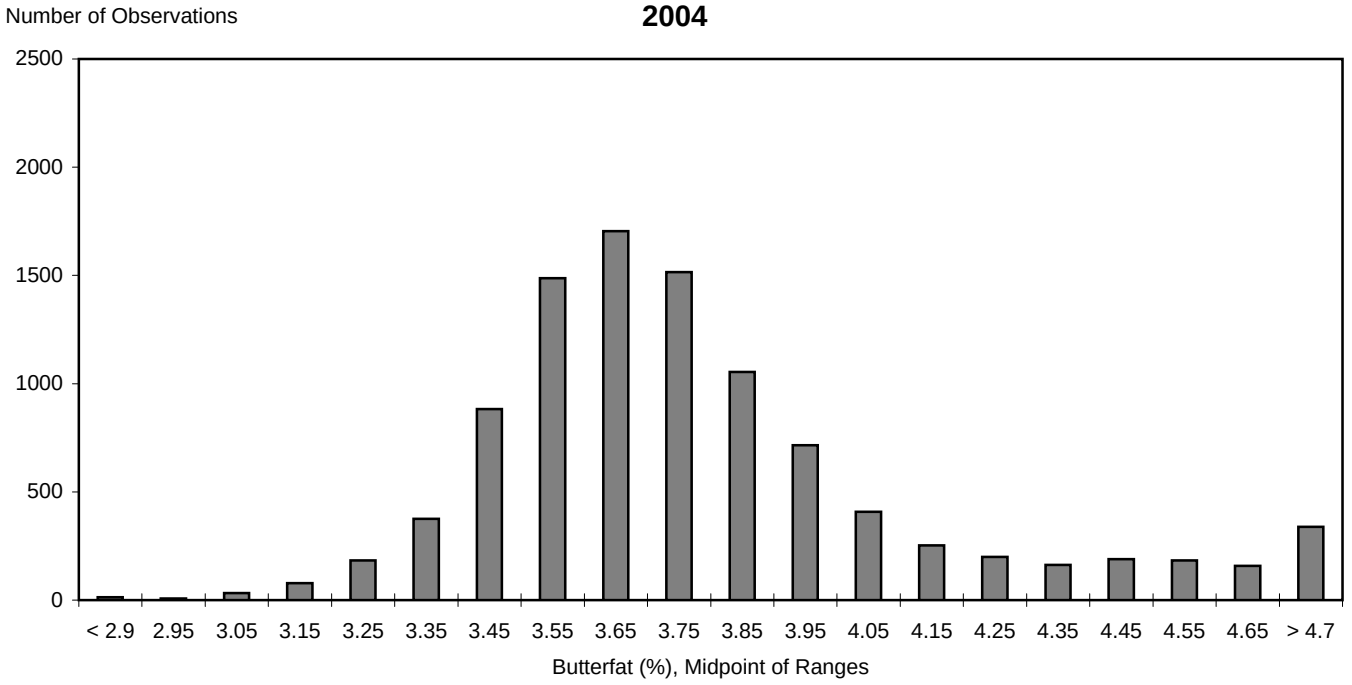


Figure A-2
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE PROTEIN LEVELS
PACIFIC NORTHWEST ORDER
2004

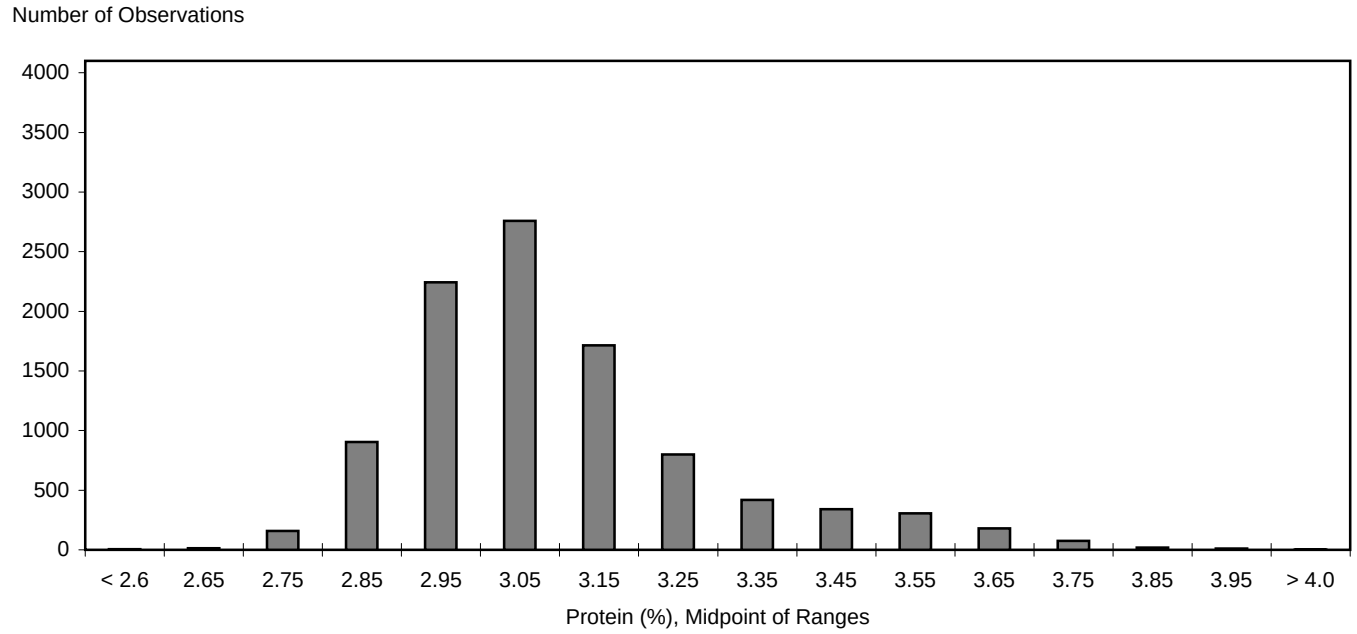


Figure A-3
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE OTHER SOLIDS LEVELS: PACIFIC NORTHWEST ORDER
2004

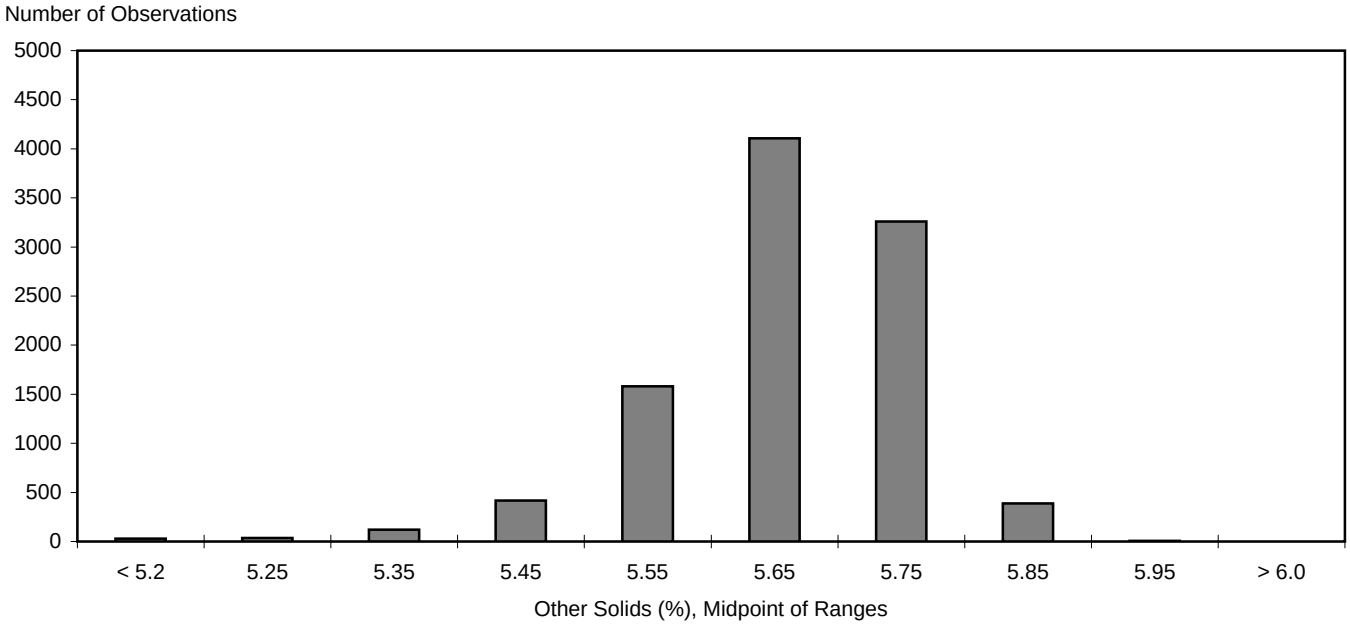


Figure A-4
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE BUTTERFAT LEVELS
ARIZONA-LAS VEGAS ORDER
2004

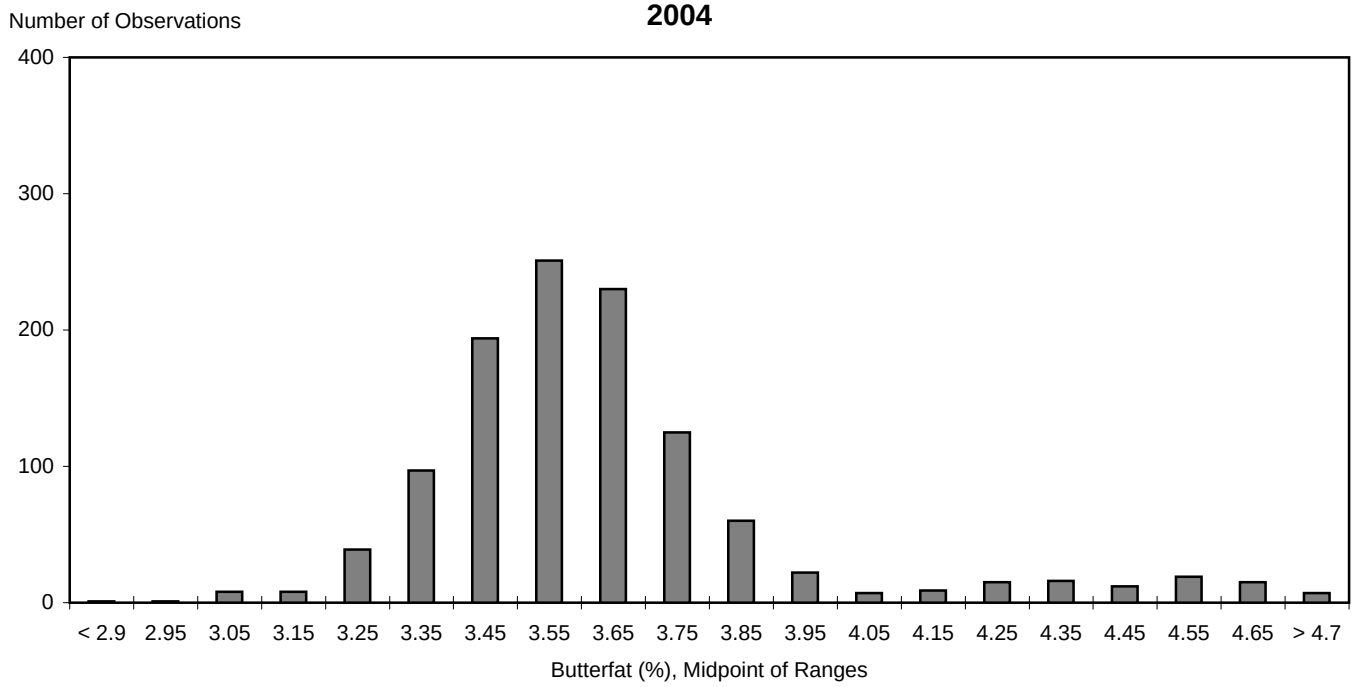
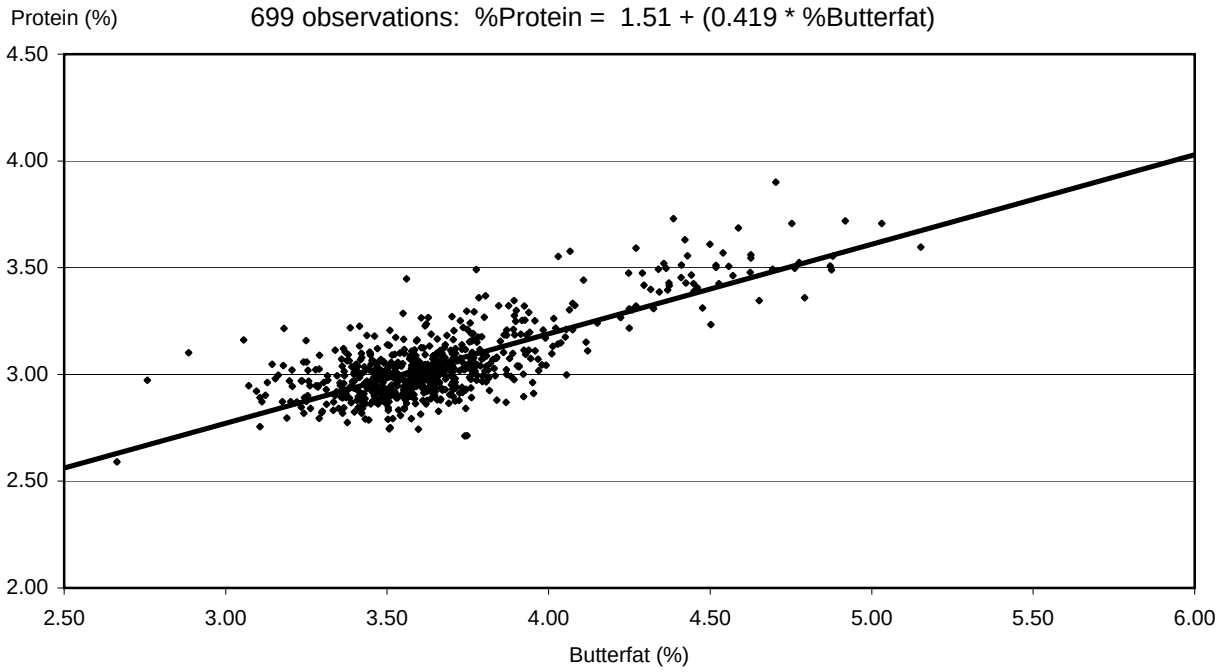


Figure A-5
SCATTER PLOT OF PROTEIN AND BUTTERFAT
MAY AND NOVEMBER 2004
Pacific Northwest Order

May 2004



November 2004

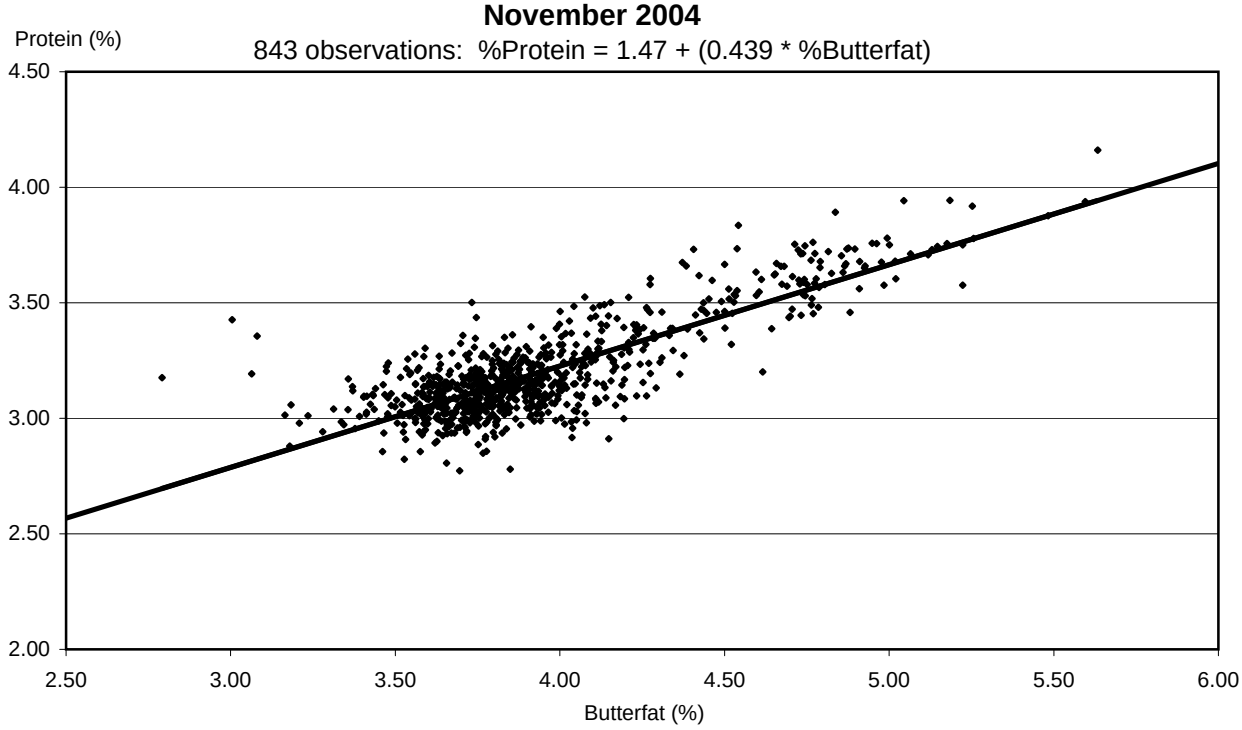
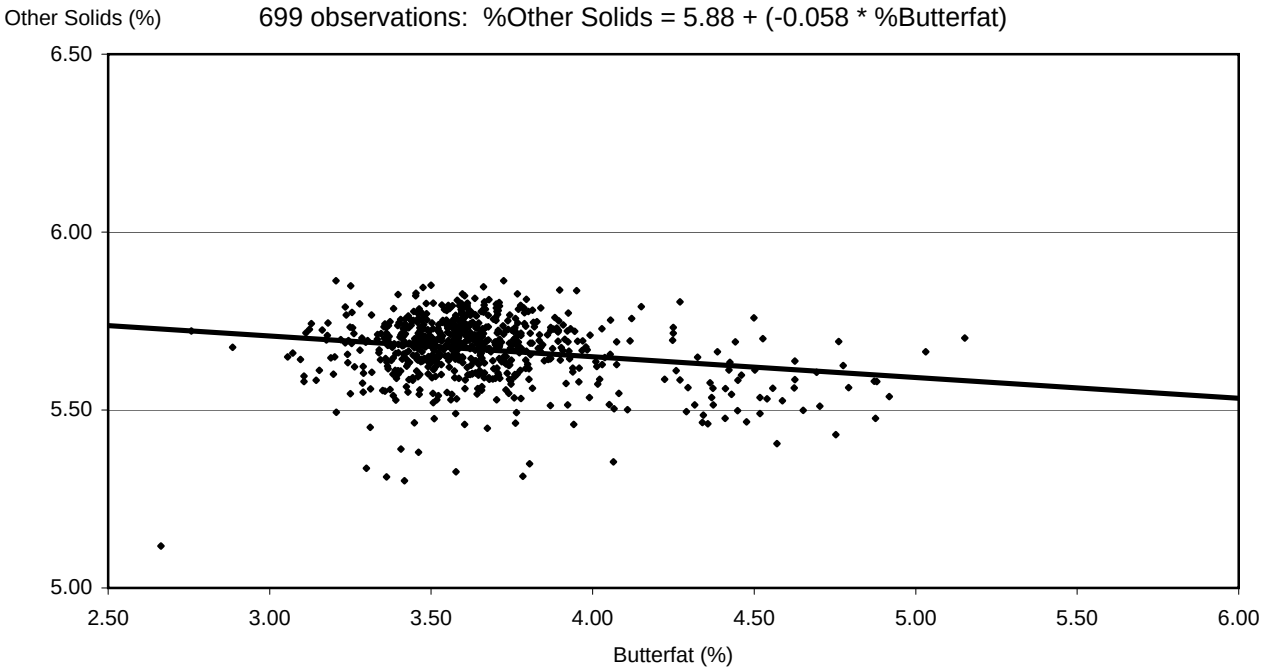


Figure A-6
SCATTER PLOT OF OTHER SOLIDS AND BUTTERFAT
MAY AND NOVEMBER 2004
Pacific Northwest Order

May 2004



November 2004

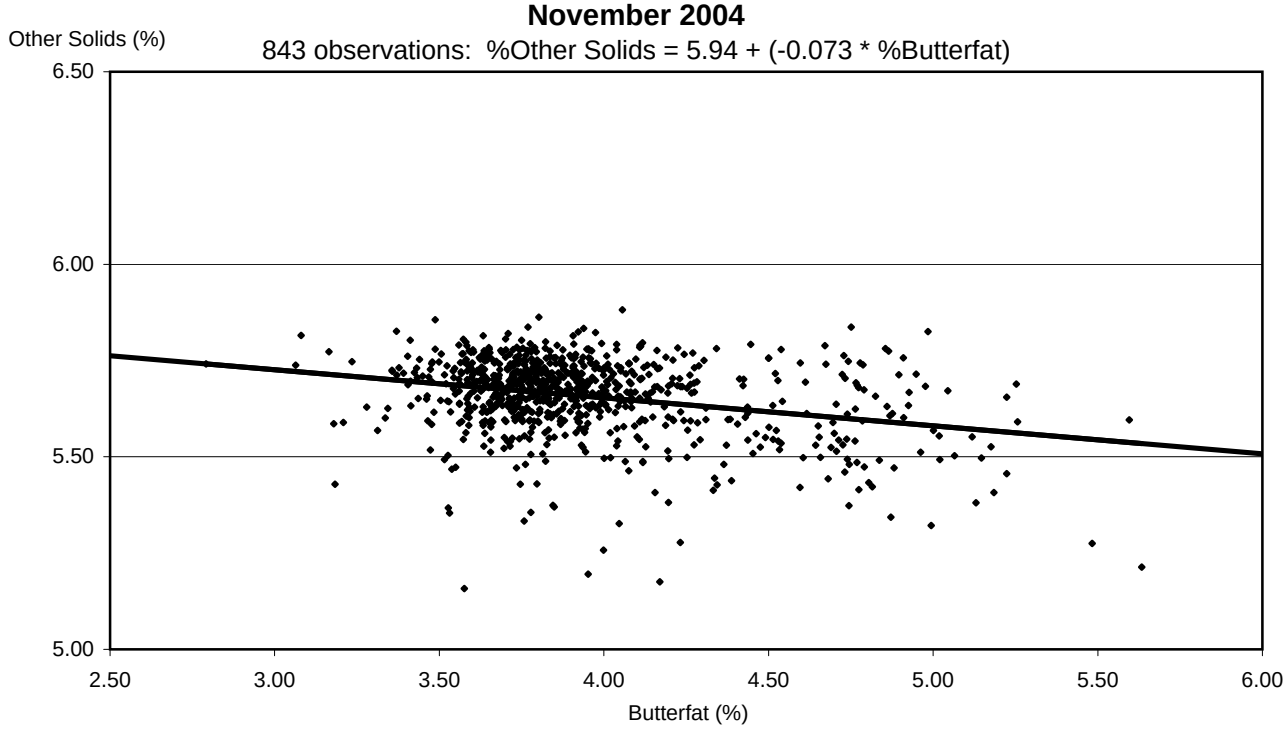
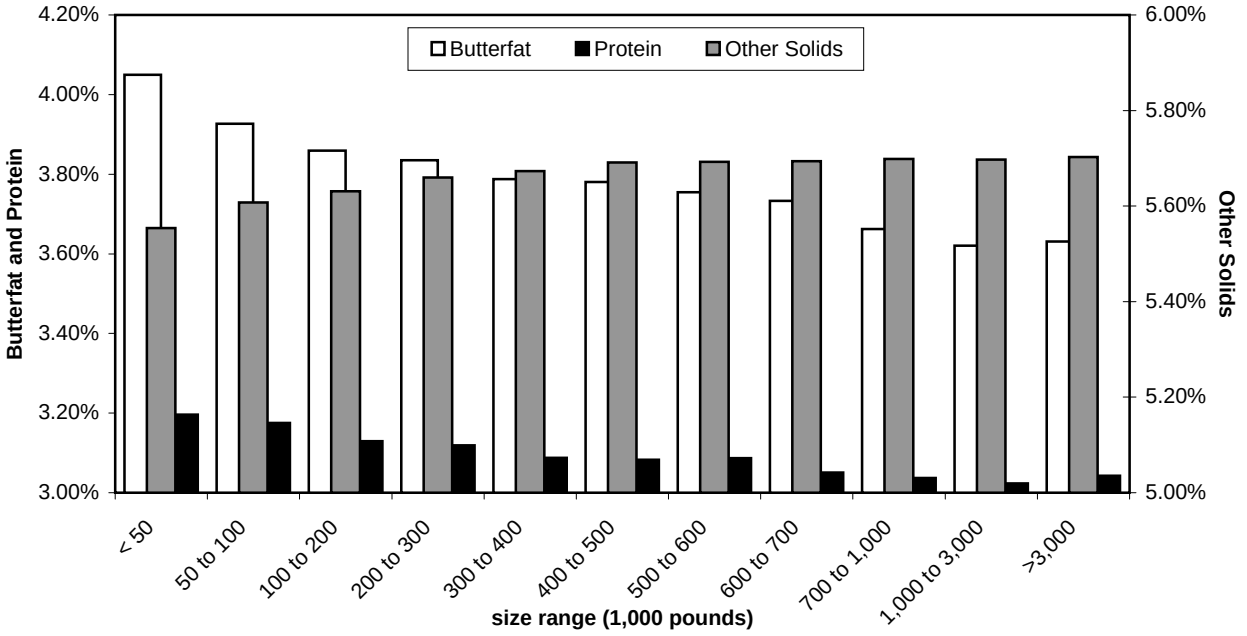


Figure A-7
WEIGHTED AVERAGE COMPONENT LEVELS
BY SIZE RANGE OF PRODUCER MILK DELIVERIES
2004

Pacific Northwest Order



Arizona-Las Vegas Order

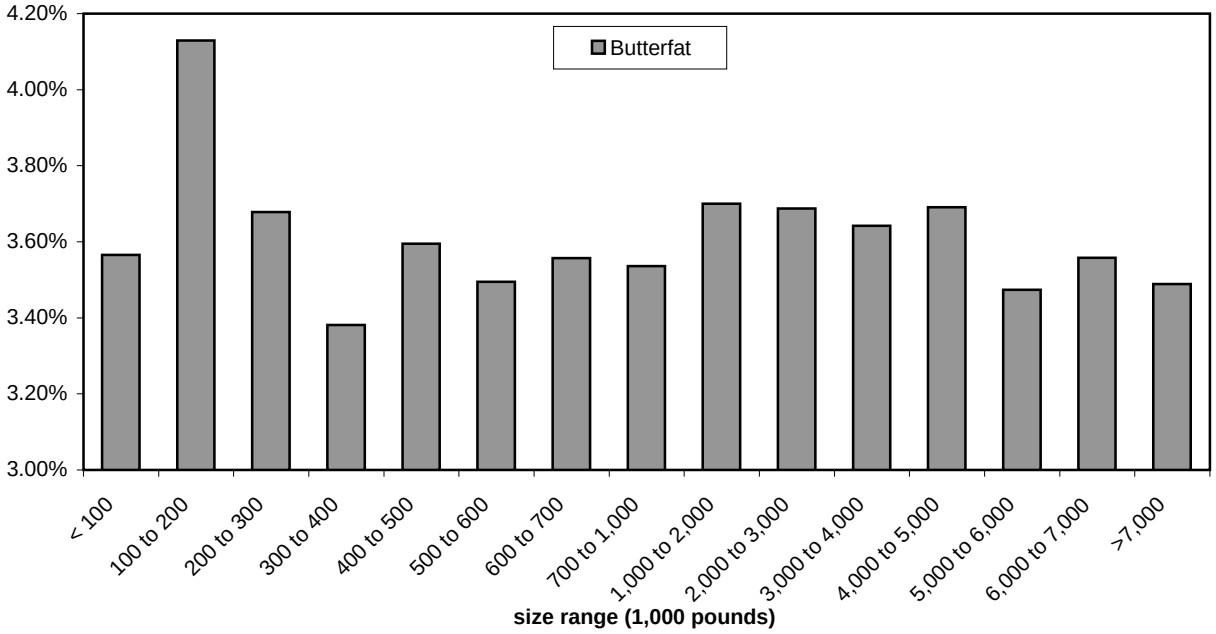
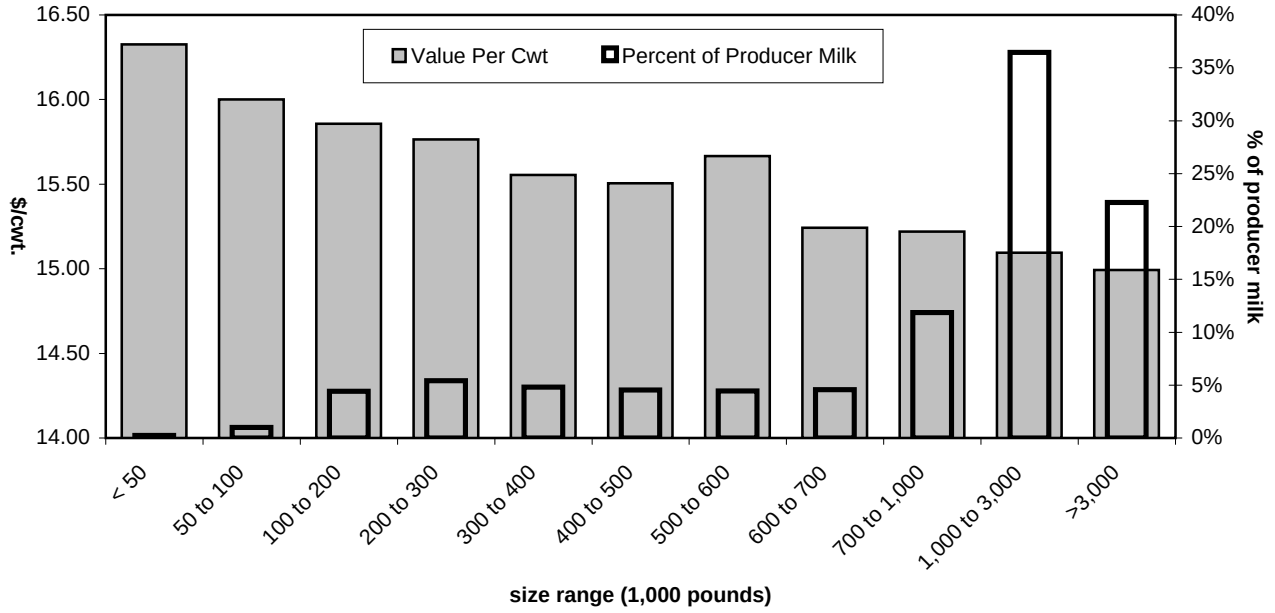
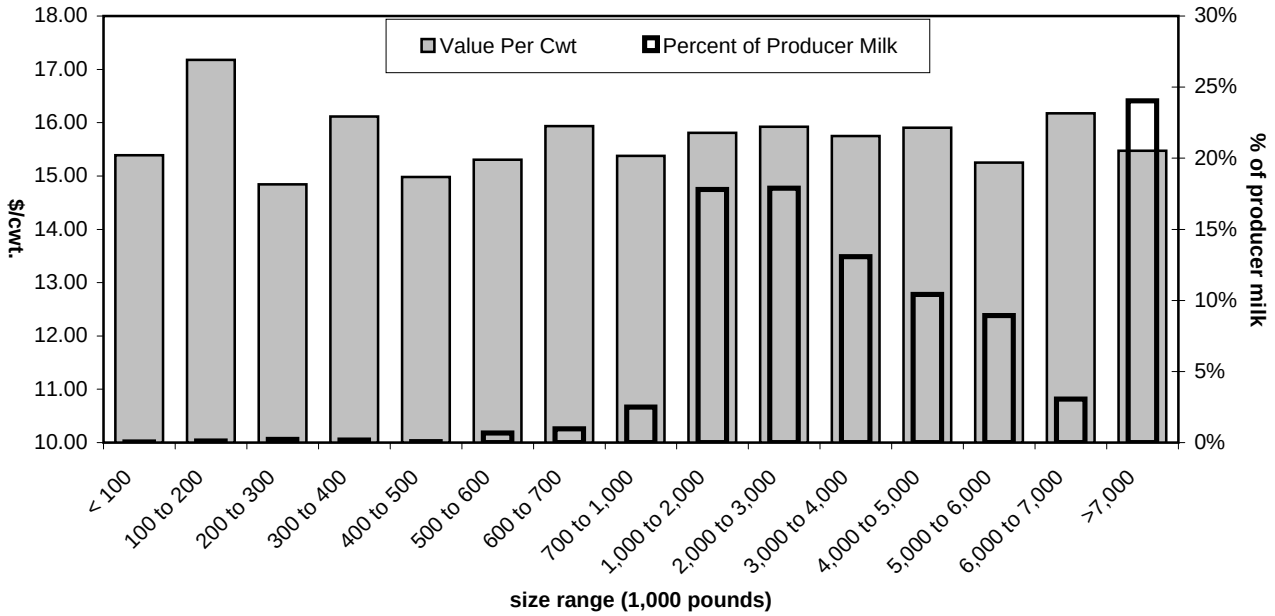


Figure A-8
WEIGHTED AVERAGE VALUES AND PERCENT OF PRODUCER MILK
BY SIZE RANGE OF PRODUCER MILK DELIVERIES
2004

Pacific Northwest Order



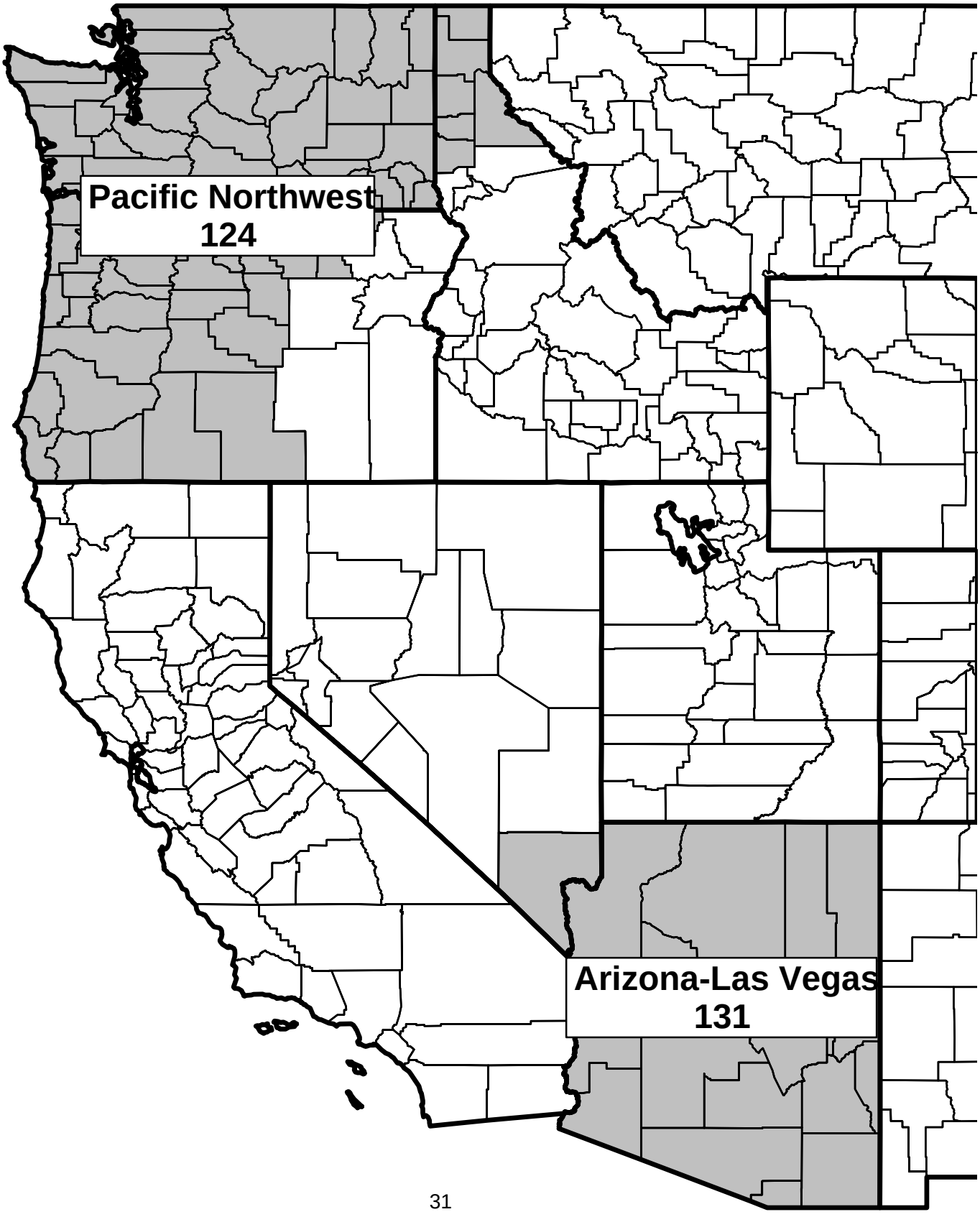
Arizona-Las Vegas Order



MAP A-1

Marketing Areas of the Pacific Northwest (FO 124)

and Arizona-Las Vegas (FO 131) Federal Orders



Map A-2

Geographic Regions Encompassing the Pacific Northwest and Arizona-Las Vegas Order Milksheds, 2004