UNITED STATES DEPARTMENT OF AGRICULTURE

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

Agricultural Marketing Service
Dairy Programs

FEDERAL MILK ORDERS 124 & 131

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

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

PACIFIC NORTHWEST AND ARIZONA * FEDERAL MILK MARKETING ORDERS

2006

Staff Paper 08-01

John Mykrantz

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* Due to the implementation of the Milk Regulatory Equity Act of 2005, the name of Federal Order 131 changed from the "Arizona-Las Vegas Order" to the "Arizona Order" and Clark County, Nevada, was removed from the marketing area effective May 1, 2006.

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

PACIFIC NORTHWEST AND ARIZONA [1] FEDERAL MILK MARKETING ORDERS

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Abstract

Component levels in producer milk pooled on the Pacific Northwest (FO 124) and Arizona (FO 131) Federal Milk Marketing Orders were analyzed for 2006 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 Order report butterfat only. Producer milk pooled was also valued using Federal order minimum producer prices for the respective orders. For 2006, a monthly average total of 871 producers were pooled on the Pacific Northwest and Arizona Orders. During 2006, these producers delivered 10.9 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 2006 average component levels for the Pacific Northwest Order were 3.69% butterfat, 3.07% true protein, and 5.70% other solids. The 2006 average butterfat level for the Arizona Order was 3.59%.
2. In both orders, butterfat levels decrease during the summer months and increase in the late fall and winter. In the Pacific Northwest Order protein showed the same seasonality as butterfat.
3. Although the volume of producer milk, number of producers, and average milk production per producer varies greatly between regions, there are relatively small differences in aggregate component levels between geographic regions within the milk sheds of the two orders.
4. The Pacific Northwest Order's linear regression in 2006 for protein is PRO% = 1.42 + 0.444 * BF%, with an R-squared of 0.63.
5. The Pacific Northwest Order's regressions for estimating other solids using butterfat have a very poor correlation (R-squared of less than 0.1). The monthly regressions show a negative relationship; other solids levels appear to be independent of butterfat levels.

[1] Due to the implementation of the Milk Regulatory Equity Act of 2005, the name of Federal Order 131 changed from the "Arizona-Las Vegas Order" to the "Arizona Order" effective May 1, 2006.

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

PACIFIC NORTHWEST AND ARIZONA [1] FEDERAL MILK MARKETING ORDERS

2006

John Mykrantz [2]

I. INTRODUCTION

This study examines milk component levels in milk pooled on the Pacific Northwest (FO 124) and Arizona (FO 131) Milk Marketing Orders during 2006. The milk components for the Pacific Northwest Order include butterfat, protein, and other solids and butterfat only for the Arizona Order. Protein and other solids were not included in any analyses concerning the Arizona Order because they were not used as a basis for pricing milk in 2006, 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 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 2006 was valued using Federal order minimum producer prices for the respective orders.

For 2006, a monthly average total of 871 producers were pooled on the Pacific Northwest and Arizona Orders. During 2006, these producers delivered 10.9 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 2006, the Pacific Northwest Order milk shed was comprised of producers located in Washington, Oregon, California, and Idaho. The Arizona Order 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

[1] Due to the implementation of the Milk Regulatory Equity Act of 2005, the name of Federal Order 131 changed from the "Arizona-Las Vegas Order" to the "Arizona Order" effective May 1, 2006.

[2] John Mykrantz is a Marketing Specialist with the Market Administrator' Office, Bothell Washington.

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 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 Order because they were not used as a basis for pricing milk in 2006, 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 less than three handlers and was, therefore, restricted.

The Pacific Northwest and Arizona Orders were divided into seven 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. 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 climate 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[3]. 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.

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

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

III. SEASONAL VARIATION IN MILK COMPONENT LEVELS

In 2006, producers associated with the Pacific Northwest Order delivered 7.6 billion pounds. For 2006, producer milk tested, on average, 3.69% butterfat, 3.07% protein, and 5.70% other solids.

In the Pacific Northwest Order, producer milk butterfat percentages decrease in the spring and increases 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 2006 were the highest in November at 3.82% and lowest in June at 3.57%.

The seasonal cycle of protein levels is similar to butterfat but with a lesser degree of variation. Protein levels in 2006 were highest in October and November at 3.17% and lowest in July at 2.99%. 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 5.75% in April, a low of 5.67% in November and December, and showed very little seasonality.

Table 1
Monthly Component Levels
Pacific Northwest Order
2006

Month	Butterfat	Protein	Other Solids
	- percent -	- percent -	- percent -
January	3.76	3.07	5.70
February	3.77	3.09	5.72
March	3.75	3.05	5.74
April	3.70	3.03	5.75
May	3.62	3.00	5.72
June	3.57	3.01	5.68
July	3.59	2.99	5.69
August	3.60	3.04	5.68
September *	3.67	3.10	5.68
October	3.76	3.17	5.68
November	3.82	3.17	5.67
December *	3.79	3.15	5.67
Weighted Average	3.69	3.07	5.70

* Eligible milk not pooled.

Table 2 Monthly Component Levels Arizona Order 2006	
Month	Butterfat - percent -
January	3.67
February	3.60
March	3.59
April	3.52
May	3.50
June	3.50
July	3.52
August	3.51
September	3.61
October	3.66
November	3.68
December	3.74
Weighted Average	3.59

In 2006, producers associated with the Arizona Order delivered 3.4 billion pounds. For 2006, producer milk tested, on average, 3.59% butterfat. Butterfat levels in the Arizona 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 Order in 2006 were highest in December at 3.74% and lowest in May and June at 3.50%.

For 2006, the monthly and annual weighted average butterfat and protein levels were less than the mean averages for both components. (See Tables 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.

During 2006, for the Pacific Northwest Order, producers' individual monthly average butterfat tests ranged from 2.49% to 5.47%; protein tests ranged from 2.21% to 4.09%, and other solids levels ranged from 4.84% to 6.15%. (See Table 3.) Most monthly average component tests are within one standard deviation of the mean[4]. Based on the definition of a standard deviation, most producers had butterfat tests ranging from 3.46% to 4.18%. Similarly, most protein tests ranged from 2.91% to 3.31%, and most other solids tests ranged from 5.56% to 5.78%. (See Appendix Table A-1 for monthly component statistics.)

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

In 2006, Arizona Order producer's butterfat tests ranged from 2.94% to 4.88%. (See Table 4.) Based on the definition of a standard deviation, most producers had butterfat tests ranging from 3.30% to 3.94%. (See Appendix Table A-2 for monthly component statistics.)

Table 3
Component Levels: Weighted Average, Mean, Median, Standard Deviation, Minimum, and Maximum
Pacific Northwest Order
2006

	Butterfat	Protein	Other Solids
	%	%	%
Weighted Average	3.69	3.07	5.70
Mean	3.82	3.11	5.67
Median	3.75	3.07	5.69
Standard Deviation	0.36	0.20	0.11
Minimum	2.49	2.21	4.84
Maximum	5.47	4.09	6.15

Table 4
Component Levels: Weighted Average, Mean, Median, Standard Deviation, Minimum, and Maximum
Arizona Order
2006

	Butterfat
	%
Weighted Average	3.59
Mean	3.62
Median	3.56
Standard Deviation	0.32
Minimum	2.94
Maximum	4.88

IV. REGIONAL VARIATION IN MILK COMPONENT LEVELS

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.

Regions 1 through 6 are associated with the Pacific Northwest region and are defined in Appendix Map A-2. Table 5, below, provides 2006 milk production, average number of producers, and component tests for each region. In 2006, the region with the most milk

associated with the Pacific Northwest Order was Region 1 followed by Regions 2, 5, 6, 3, and 4. With the exception of Regions 4 and 5, component levels for each region appear to vary only slightly.

Table 5
Various Statistics by Region For 2006

Region 1 (Western Washington)		**Region 2 (Central Washington)**	
Milk Production	2,454,795,578	Milk Production	2,238,667,625
Average Number of Producers	352	Average Number of Producers	94
Average Pounds Per Producer	6,973,851	Average Pounds Per Producer	23,815,613
Butterfat Test	3.67%	Butterfat Test	3.61%
Protein Test	3.05%	Protein Test	3.02%
Other Solids Test	5.69%	Other Solids Test	5.69%
Region 3 (Eastern Washington)		**Region 4 (Northern Idaho)**	
Milk Production	423,065,076	Milk Production	12,338,125
Average Number of Producers	43	Average Number of Producers	8
Average Pounds Per Producer	9,838,723	Average Pounds Per Producer	1,542,266
Butterfat Test	3.67%	Butterfat Test	3.85%
Protein Test	3.06%	Protein Test	3.09%
Other Solids Test	5.70%	Other Solids Test	5.70%
Region 5 (Western Oregon, Northern California)		**Region 6 (Central/Eastern Oregon, Southern Idaho)**	
Milk Production	1,317,863,070	Milk Production	1,117,283,111
Average Number of Producers	222	Average Number of Producers	60
Average Pounds Per Producer	5,936,320	Average Pounds Per Producer	18,621,385
Butterfat Test	3.87%	Butterfat Test	3.71%
Protein Test	3.15%	Protein Test	3.09%
Other Solids Test	5.73%	Other Solids Test	5.71%
Region 7 (Arizona/Southern California)			
Milk Production	3,383,343,076		
Average Number of Producers	92		
Average Pounds Per Producer	36,775,468		
Butterfat Test	3.59%		
Protein Test	n/a		
Other Solids Test	n/a		

n/a = not applicable

Region 7 represents the Arizona Order. In general, comparing all the regions, Region 7 had the most milk pooled in 2006, with 3.4 billion pounds, while Region 1 had the most producers (352 producers on average). Average milk production per producer was the highest in Region 7 with an average of 36.8 million pounds per producer for the year. The highest butterfat levels in 2006 were in Region 5 with annual tests of 3.87%, while Region 7 had the lowest annual butterfat test of 3.59%. Protein levels in Region 5 (3.15%) and other solids levels in Region 5 (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 2006, butterfat levels in Regions 4 and 5 were noticeably higher than the other regions, while Regions 2 and 7 were much lower than the other regions. Protein levels in Regions 5 were 0.13% higher than Region 2. Other solids levels by region varied only 0.04% between the high and low for the year 2006.

Changes in producer numbers and milk marketed between November 2005 and November 2006 followed the national trend of increased milk production by fewer producers. Although November is a representative month, this comparison shows effects of handlers' decisions and changes in Federal Order regulations between 2005 and 2006. On a regional basis, the movement of milk production in Washington State from Western Washington to Central Washington continued. Region 2, Central Washington, increased in milk production by 11.4 million pounds between November of 2005 and 2006, with the same number of producers. Region 1, Western Washington, decreased by 15.2 million pounds of milk and decreased by 34 producers. (See Table 6.) For Region 6, changes in producer numbers and producer milk are a result of handler pooling decisions and not indicative of the reductions in those areas. For Region 7, changes in producer numbers and producer milk are a result of changes in Federal order regulations and not wholly indicative of growth in those areas. Regions 3 and 5 showed slight decreases in producer numbers and increases in producer milk, consistent with the national trend of decreasing dairy farm numbers but more production per farm. Region 5, Western Oregon, faces many of the same environmental issues and urban encroachment problems as Region 1, Western Washington, but was able to maintain production levels.

Table 6
Producer Milk and Producers by Region for November 2006 and 2005

	Producer Milk			Producers		
	November 2006	November 2005	Change	November 2006	November 2005	Change
Region 1	183,689,322	198,888,860	-15,199,538	345	379	-34
Region 2	202,853,300	191,457,521	11,395,779	102	102	0
Region 3	35,472,131	31,648,323	3,823,808	41	44	-3
Region 4	945,949	1,180,820	-234,871	8	9	-1
Region 5	112,474,571	110,533,120	1,941,451	245	250	-5
Region 6	60,956,359	70,211,848	-9,255,489	20	73	-53
Region 7	276,876,746	237,093,328	39,783,418	93	86	7
Total	873,268,378	841,013,820	32,254,558	854	943	-89

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 Tables A-4 and A-5 and Figures A-5 and A-6.).

The Pacific Northwest Order had 9,352 observations in 2006. This year's regressions are similar to other Federal order publications.[5] Appendix Figures A-5 and A-6 show graphical representations of the linear regressions for May and November 2006.

The butterfat and protein regression equations for the Pacific Northwest Order were calculated for 2000 through 2006. (See Table 7 below.) Over the 2000 - 2006 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 2006 compared to previous years.

Table 7
Pacific Northwest Order
Comparison of Regression Results: Butterfat Level as a Predictor of Protein Levels
2000 through 2006

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%	$R^2 = 0.652$
2005	TRUE PRO% = 1.438 + 0.438 BF%	$R^2 = 0.663$
2006	TRUE PRO% = 1.418 + 0.444 BF%	$R^2 = 0.626$

[5] See *Analysis of Component Levels and Somatic Cell Count in Individual Herd Milk at the Farm Level, 2006,* Upper Midwest Marketing Area, Staff paper 07-01, December 2007.

VI. MINIMUM ORDER VALUE OF MILK PRODUCTION

The use of monthly component prices allows for the evaluation of the minimum order value of milk components in a hundredweight of milk.

The minimum order value at test of producer milk pooled on the Pacific Northwest Order in 2006 averaged $12.44 per hundredweight. The weighted average value of each component comprising the $12.44 per hundredweight was: $4.87 for butterfat; $6.37 for protein; $0.97 for other solids; and a producer price differential of $0.22.[6]

The value of producers' milk at test pooled on the Arizona Order in 2006 averaged $12.69 per hundredweight. The weighted average value of skim and butterfat portions of the $12.69 per hundredweight was: $4.78 for butterfat; and $7.91 for skim.[7]

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 are summarized in Appendix Table A-7 and Figure A-7. The inverse relationship between size-range and producer butterfat and protein levels is more apparent on the Pacific Northwest Order than in the levels of butterfat on the Arizona 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.

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 2006 Federal order prices, producers with less than 50,000 pounds of production was valued more per hundredweight, $12.48, than other producers. Producers with 3-4 million pounds of production averaged the lowest amount per hundredweight, at $11.26. This relationship is generally indicative of the fact that smaller herds typically have higher component levels than larger herds. On the Arizona Order, using skim-butterfat values, a relationship between size-range and value per hundredweight was less evident. The Arizona Order data was broken down further for producers over one million pounds into smaller increments (e.g. 4-5 million pounds, 5-6 million pounds, 6-7 million pounds) to determine whether the size-range categories used masked any relationships. Using smaller increments does not indicate producers pooled on the Arizona Order who have more milk deliveries have a lower value of milk per hundredweight.

[6] 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. Values do not add to total due to rounding.
[7] The producer prices for the Arizona Order are subject to applicable location adjustments. The effects of the location adjustment are not dealt with in this study.

VII. SUMMARY

This paper analyzes milk components associated with the Pacific Northwest and Arizona Orders. Handlers regulated under the Pacific Northwest Order report butterfat, protein, and other solids. Handlers regulated under the Arizona 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 2006 were: 3.69% butterfat, 3.07% protein, and 5.70% other solids. Butterfat percentages peaked in November and reached a low in June. 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 sheds of the two orders.

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

$$\text{Protein} = 1.4176 + 0.4437 * \text{Butterfat} \qquad (R^2 = 0.6259)$$

In 2006, the Pacific Northwest Order's weighted average price received for milk was $12.44 per hundredweight, at test.

The annual average butterfat level for the Arizona Order in 2006 was 3.59%. Butterfat levels peaked in December and reached a low in May and June. In 2006, the Federal order weighted average price received for milk was $12.69 per hundredweight, at test.

In general, for the Pacific Northwest Order, 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

2006

Butterfat

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	3.76	3.90	0.36	3.81	3.13	5.27	835
February	3.77	3.89	0.35	3.81	3.09	5.29	835
March	3.75	3.88	0.35	3.80	3.02	5.37	835
April	3.70	3.81	0.33	3.73	2.82	5.15	840
May	3.62	3.72	0.34	3.64	2.49	4.99	836
June	3.57	3.69	0.33	3.61	2.76	5.05	821
July	3.59	3.70	0.32	3.62	2.91	4.99	821
August	3.60	3.73	0.33	3.65	2.87	4.94	814
September	3.67	3.79	0.33	3.72	2.92	5.16	621
October	3.76	3.92	0.39	3.82	3.19	5.24	769
November	3.82	3.98	0.39	3.89	3.16	5.47	761
December	3.79	3.91	0.38	3.83	3.15	5.44	564
For the Year	3.69	3.82	0.36	3.75	2.49	5.47	9,352

Protein

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	3.07	3.12	0.20	3.07	2.59	3.96	835
February	3.09	3.12	0.19	3.08	2.39	3.79	835
March	3.05	3.09	0.19	3.05	2.53	3.77	835
April	3.03	3.07	0.19	3.02	2.57	3.84	840
May	3.00	3.07	0.20	3.02	2.35	3.89	836
June	3.01	3.07	0.19	3.03	2.42	3.78	821
July	2.99	3.05	0.19	3.01	2.34	3.76	821
August	3.04	3.08	0.19	3.04	2.25	3.77	814
September	3.10	3.13	0.18	3.10	2.38	3.87	621
October	3.17	3.22	0.21	3.17	2.41	4.09	769
November	3.17	3.22	0.21	3.16	2.21	4.07	761
December	3.15	3.18	0.21	3.13	2.27	3.93	564
For the Year	3.07	3.11	0.20	3.07	2.21	4.09	9,352

Table A-1 (Continued)

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

2006

Other Solids

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	5.70	5.68	0.10	5.70	5.10	5.90	835
February	5.72	5.70	0.10	5.72	5.11	5.91	835
March	5.74	5.72	0.09	5.73	5.26	5.97	835
April	5.75	5.73	0.09	5.74	5.24	6.15	840
May	5.72	5.69	0.09	5.71	4.97	5.88	836
June	5.68	5.65	0.10	5.66	4.84	5.89	821
July	5.69	5.67	0.10	5.68	5.00	5.88	821
August	5.68	5.65	0.10	5.66	4.92	5.86	814
September	5.68	5.63	0.11	5.65	4.86	5.91	621
October	5.68	5.64	0.11	5.66	4.97	5.87	769
November	5.67	5.64	0.11	5.66	4.91	5.88	761
December	5.67	5.63	0.11	5.66	4.92	5.88	564
For the Year	5.70	5.67	0.11	5.69	4.84	6.15	9,352

Table A-2

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

2006

Butterfat

Month	Weighted Average	Mean	Standard Deviation	Median	Minimum	Maximum	Number of Observations
	- % -	- % -	- % -	- % -	- % -	- % -	
January	3.67	3.73	0.32	3.66	3.27	4.81	87
February	3.60	3.66	0.31	3.58	3.24	4.68	86
March	3.59	3.63	0.32	3.57	3.18	4.68	84
April	3.52	3.56	0.29	3.49	3.18	4.67	93
May	3.50	3.53	0.28	3.47	3.00	4.46	94
June	3.50	3.51	0.28	3.46	3.04	4.44	97
July	3.52	3.53	0.29	3.49	2.96	4.53	95
August	3.51	3.55	0.31	3.50	2.95	4.43	92
September	3.61	3.64	0.29	3.59	3.02	4.76	93
October	3.66	3.70	0.33	3.62	2.96	4.85	94
November	3.68	3.71	0.32	3.63	2.94	4.85	93
December	3.74	3.77	0.31	3.70	3.21	4.88	91
For the Year	3.59	3.62	0.32	3.56	2.94	4.88	1,099

* Due to the implementation of the Milk Regulatory Equity Act of 2005, the name of Federal Order 131 changed from the "Arizona-Las Vegas Order" to the "Arizona Order" and Clark County, Nevada, was removed from the marketing area effective May 1, 2006.

Table A-3

WEIGHTED AVERAGE COMPONENT LEVELS BY REGION
2006

Butterfat

	Region 1	No.*	Region 2	No.*	Region 3	No.*	Region 4	No.*
	-% -		-% -		-% -		-% -	
January	3.71	361	3.71	102	3.77	45	3.96	9
February	3.72	361	3.68	102	3.73	45	3.92	9
March	3.71	359	3.65	102	3.66	45	3.83	8
April	3.66	360	3.60	103	3.66	45	3.83	8
May	3.59	358	3.52	103	3.60	44	3.75	8
June	3.55	351	3.49	102	3.58	43	3.67	8
July	3.59	350	3.49	101	3.57	43	3.66	8
August	3.59	346	3.49	101	3.55	43	3.77	8
September	3.68	347	3.58	50	3.63	43	3.90	8
October	3.73	346	3.68	102	3.68	42	3.98	8
November	3.78	345	3.77	102	3.79	41	4.00	8
December	3.75	339	3.79	56	3.85	40	3.95	8
For the Year	3.67	352	3.61	94	3.67	43	3.85	8

	Region 5	No.*	Region 6	No.*	Region 7	No.*
	-% -		-% -		-% -	
January	3.93	248	3.76	70	3.67	87
February	3.95	245	3.85	73	3.60	86
March	3.95	247	3.82	74	3.59	84
April	3.88	248	3.75	76	3.52	93
May	3.80	247	3.65	76	3.50	94
June	3.78	247	3.48	70	3.50	97
July	3.78	245	3.60	74	3.52	95
August	3.81	241	3.63	75	3.51	92
September	3.74	104	3.69	69	3.61	93
October	3.95	248	3.81	23	3.66	94
November	3.99	245	3.81	20	3.68	93
December	3.86	101	3.77	20	3.74	91
For the Year	3.87	222	3.71	60	3.59	92

Table A-3 (Continued)

WEIGHTED AVERAGE COMPONENT LEVELS BY REGION
2006

Protein

	Region 1	No.*	Region 2	No.*	Region 3	No.*	Region 4	No.*
	-% -		-% -		-% -		-% -	
January	3.04	361	3.05	102	3.08	45	3.14	9
February	3.06	361	3.05	102	3.10	45	3.13	9
March	3.03	359	3.02	102	3.06	45	3.10	8
April	3.00	360	2.99	103	3.03	45	3.06	8
May	2.99	358	2.94	103	2.99	44	3.00	8
June	3.01	351	2.96	102	2.99	43	3.02	8
July	3.00	350	2.91	101	2.93	43	2.99	8
August	3.04	346	2.97	101	3.00	43	3.02	8
September	3.10	347	3.06	50	3.08	43	3.09	8
October	3.14	346	3.13	102	3.16	42	3.19	8
November	3.14	345	3.15	102	3.17	41	3.18	8
December	3.13	339	3.14	56	3.17	40	3.17	8
For the Year	3.05	352	3.02	94	3.06	43	3.09	8

	Region 5	No.*	Region 6	No.*	Region 7	No.*
	-% -		-% -		-% -	
January	3.14	248	3.07	70	N/A	N/A
February	3.15	245	3.13	73	N/A	N/A
March	3.12	247	3.09	74	N/A	N/A
April	3.11	248	3.06	76	N/A	N/A
May	3.12	247	3.03	76	N/A	N/A
June	3.12	247	3.00	70	N/A	N/A
July	3.10	245	3.01	74	N/A	N/A
August	3.14	241	3.07	75	N/A	N/A
September	3.14	104	3.13	69	N/A	N/A
October	3.25	248	3.25	23	N/A	N/A
November	3.24	245	3.23	20	N/A	N/A
December	3.18	101	3.22	20	N/A	N/A
For the Year	3.15	222	3.09	60	N/A	N/A

Table A-3 (Continued)

WEIGHTED AVERAGE COMPONENT LEVELS BY REGION
2006

Other Solids

	Region 1	No.*	Region 2	No.*	Region 3	No.*	Region 4	No.*
	-% -		-% -		-% -		-% -	
January	5.70	361	5.68	102	5.69	45	5.67	9
February	5.72	361	5.71	102	5.73	45	5.72	9
March	5.73	359	5.72	102	5.73	45	5.76	8
April	5.74	360	5.73	103	5.76	45	5.77	8
May	5.71	358	5.71	103	5.72	44	5.74	8
June	5.65	351	5.67	102	5.67	43	5.69	8
July	5.68	350	5.68	101	5.69	43	5.72	8
August	5.66	346	5.67	101	5.67	43	5.68	8
September	5.66	347	5.68	50	5.68	43	5.67	8
October	5.66	346	5.68	102	5.68	42	5.68	8
November	5.66	345	5.65	102	5.67	41	5.68	8
December	5.66	339	5.66	56	5.67	40	5.67	8
For the Year	5.69	352	5.69	94	5.70	43	5.70	8

	Region 5	No.*	Region 6	No.*	Region 7	No.*
	-% -		-% -		-% -	
January	5.74	248	5.70	70	N/A	N/A
February	5.74	245	5.73	73	N/A	N/A
March	5.77	247	5.74	74	N/A	N/A
April	5.77	248	5.76	76	N/A	N/A
May	5.74	247	5.72	76	N/A	N/A
June	5.73	247	5.68	70	N/A	N/A
July	5.73	245	5.70	74	N/A	N/A
August	5.72	241	5.70	75	N/A	N/A
September	5.72	104	5.68	69	N/A	N/A
October	5.71	248	5.70	23	N/A	N/A
November	5.71	245	5.68	20	N/A	N/A
December	5.70	101	5.69	20	N/A	N/A
For the Year	5.73	222	5.71	60	N/A	N/A

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

Table A-4

LINEAR RELATIONSHIPS BETWEEN VARIOUS MILK COMPONENTS
2006

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	1.39156	0.44259	0.01179	0.61967	0.12421	835
February	1.48688	0.41959	0.01218	0.58697	0.12420	835
March	1.48058	0.41429	0.01215	0.58199	0.12176	835
April	1.37469	0.44501	0.01247	0.60255	0.12046	840
May	1.33544	0.46564	0.01314	0.60053	0.12876	836
June	1.37169	0.46124	0.01192	0.64583	0.11330	821
July	1.17258	0.50716	0.01196	0.68658	0.10859	821
August	1.39523	0.45250	0.01171	0.64715	0.11159	814
September	1.53767	0.42158	0.01428	0.58401	0.11600	621
October	1.53757	0.42895	0.01126	0.65392	0.12110	769
November	1.50403	0.42989	0.01141	0.65109	0.12382	761
December	1.47110	0.43659	0.01420	0.62661	0.12723	564
For the Year	1.41758	0.44374	0.00355	0.62585	0.12464	9,352

Table A-5

LINEAR RELATIONSHIPS BETWEEN VARIOUS MILK COMPONENTS
2006

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

Pacific Northwest Order

	c	b				
	Constant	Butterfat Coefficient	Standard Error of b	R-Squared (Adjusted)	Standard Error	Number of Comparisons
January	6.00651	-0.08454	0.01032	0.07094	0.10881	835
February	5.95487	-0.06577	0.00918	0.05692	0.09358	835
March	5.92480	-0.05399	0.00928	0.03791	0.09296	835
April	5.96445	-0.06266	0.00956	0.04765	0.09231	840
May	5.87407	-0.04886	0.00919	0.03161	0.09009	836
June	5.77728	-0.03358	0.01094	0.01017	0.10395	821
July	5.80963	-0.03873	0.01069	0.01457	0.09703	821
August	5.75564	-0.02906	0.01071	0.00777	0.10201	814
September	6.07388	-0.11626	0.01295	0.11377	0.10519	621
October	5.93832	-0.07645	0.01010	0.06827	0.10867	769
November	5.93959	-0.07549	0.01004	0.06804	0.10900	761
December	6.12443	-0.12603	0.01145	0.17579	0.10265	564
For the Year	5.91145	-0.06295	0.00298	0.04542	0.10472	9,352

Table A-6

MONTHLY PRODUCER COMPONENT PRICES
2006

Pacific Northwest Order

Month	Butterfat Price $ / pound	Protein Price $ / pound	Other Solids Price $ / pound	Producer Price Differential 1/ $ / hundredweight
January	1.4684	2.3994	0.1881	0.05
February	1.3469	2.1220	0.1999	0.40
March	1.2596	1.8836	0.1874	0.75
April	1.2343	1.9238	0.1508	0.42
May	1.2582	1.9115	0.1251	0.47
June	1.2436	2.0790	0.1255	0.01
July	1.2228	1.9807	0.1257	0.37
August	1.3008	1.9050	0.1416	0.42
September	1.4191	2.1346	0.1649	(0.40)
October	1.4149	2.0775	0.2026	0.20
November	1.3852	2.2383	0.2276	0.01
December	1.3481	2.4388	0.2564	(0.48)
Simple Average	1.3252	2.0912	0.1746	0.19

1/ 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.

Arizona Order *

Month	Skim Price 2/ $ / hundredweight	Butterfat Price 2/ $ / pound
January	8.89	1.4792
February	8.52	1.3750
March	7.99	1.2858
April	7.56	1.2469
May	7.47	1.2597
June	7.54	1.2540
July	7.80	1.2350
August	7.93	1.2864
September	8.19	1.3884
October	8.56	1.4237
November	8.91	1.3963
December	9.27	1.3613
Simple Average	8.22	1.3326

* Due to the implementation of the Milk Regulatory Equity Act of 2005, the name of Federal Order 131 changed from the "Arizona-Las Vegas Order" to the "Arizona Order" and Clark County, Nevada, was removed from the marketing area effective May 1, 2006.

2/ The producer prices for the Arizona 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
2006
(See Figure A-7)
Pacific Northwest Order

Size Range				
Equal to or more than	Less than	Butterfat	Protein	Other Solids
- pounds -	- pounds -	- % -	- % -	- % -
	50,000	4.04	3.19	5.55
50,000	100,000	3.96	3.16	5.61
100,000	200,000	3.91	3.14	5.64
200,000	300,000	3.90	3.15	5.68
300,000	400,000	3.86	3.14	5.69
400,000	500,000	3.85	3.12	5.69
500,000	600,000	3.77	3.10	5.70
600,000	700,000	3.75	3.09	5.70
700,000	1,000,000	3.70	3.06	5.71
1,000,000	2,000,000	3.68	3.06	5.71
2,000,000	3,000,000	3.64	3.04	5.70
3,000,000	4,000,000	3.67	3.05	5.71
4,000,000	6,000,000	3.62	3.04	5.69
6,000,000		3.59	3.03	5.70
Weighted Average		3.69	3.07	5.70

Table A-7 (Continued)

AGGREGATED COMPONENT TESTS BY SIZE-RANGE
PRODUCER MILK DELIVERIES
2006

(See Figure A-7)

Arizona Order*

Size Range		
Equal to or more than	Less than	Butterfat
- pounds -	- pounds -	- % -
	100,000	3.53
100,000	200,000	4.26
200,000	300,000	3.53
300,000	400,000	3.50
400,000	500,000	3.27
500,000	600,000	3.37
600,000	700,000	3.41
700,000	1,000,000	3.62
1,000,000	2,000,000	3.68
2,000,000	3,000,000	3.66
3,000,000	4,000,000	3.63
4,000,000	5,000,000	3.68
5,000,000	6,000,000	3.57
6,000,000	7,000,000	3.51
7,000,000		3.49
Weighted Average		3.59

* Due to the implementation of the Milk Regulatory Equity Act of 2005, the name of Federal Order 131 changed from the "Arizona-Las Vegas Order" to the "Arizona Order" and Clark County, Nevada, was removed from the marketing area effective May 1, 2006.

Table A-8

AGGREGATED COMPONENT VALUES BY SIZE-RANGE
PRODUCER MILK DELIVERIES
2006
(See Figure A-8)
Pacific Northwest Order

Size Range					
Equal to or more than	Less than	Aggregated Component Values 1/	Producer Milk	Percent of Producer Milk	Weighted Average Value
- pounds -	- pounds -	- dollars -	- pounds -	- % -	- dollars/cwt. -
	50,000	$ 1,817,437.56	14,564,895	0.19%	12.48
50,000	100,000	7,401,867.34	60,716,315	0.80%	12.19
100,000	200,000	30,651,432.51	255,747,897	3.38%	11.99
200,000	300,000	35,979,639.02	293,909,767	3.89%	12.24
300,000	400,000	31,247,393.66	261,107,634	3.45%	11.97
400,000	500,000	30,251,401.35	254,340,669	3.36%	11.89
500,000	600,000	34,803,613.25	295,626,656	3.91%	11.77
600,000	700,000	29,404,306.79	252,987,689	3.34%	11.62
700,000	1,000,000	79,646,979.92	687,981,630	9.10%	11.58
1,000,000	2,000,000	200,587,732.86	1,739,449,075	23.00%	11.53
2,000,000	3,000,000	113,654,510.19	973,418,322	12.87%	11.68
3,000,000	4,000,000	57,647,546.86	511,961,802	6.77%	11.26
4,000,000	6,000,000	66,943,483.49	589,906,314	7.80%	11.35
6,000,000		158,164,873.03	1,372,293,920	18.14%	11.53
Total/Weighted Average		$ 878,202,217.84	7,564,012,585	100.00%	11.61

Table A-8 (Continued)

AGGREGATED COMPONENT VALUES BY SIZE-RANGE
PRODUCER MILK DELIVERIES
2006
(See Figure A-8)
Arizona Order*

Size Range					
Equal to or more than	Less than	Aggregated Component Values 1/	Producer Milk	Percent of Producer Milk	Weighted Average Value
- pounds -	- pounds -	- dollars -	- pounds -	- % -	- dollars/cwt. -
	100,000	$ 132,351.86	1,067,040	0.03%	12.40
100,000	200,000	292,775.95	2,198,197	0.06%	13.32
200,000	300,000	674,170.28	5,242,666	0.15%	12.86
300,000	400,000	721,746.64	5,672,453	0.17%	12.72
400,000	500,000	764,430.60	6,344,364	0.19%	12.05
500,000	600,000	1,185,020.55	9,291,409	0.27%	12.75
600,000	700,000	1,389,598.70	11,155,666	0.33%	12.46
700,000	1,000,000	8,794,523.12	69,236,665	2.05%	12.70
1,000,000	2,000,000	58,429,461.31	454,854,679	13.44%	12.85
2,000,000	3,000,000	62,003,238.01	483,790,373	14.30%	12.82
3,000,000	4,000,000	51,036,101.20	400,013,535	11.82%	12.76
4,000,000	5,000,000	49,734,143.28	388,208,744	11.47%	12.81
5,000,000	6,000,000	43,939,391.95	347,088,432	10.26%	12.66
6,000,000	7,000,000	29,434,807.46	237,009,192	7.01%	12.42
7,000,000		120,641,564.87	962,169,661	28.44%	12.54
Total/Weighted Average		$ 429,173,325.78	3,383,343,076	100.00%	12.68

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

* Due to the implementation of the Milk Regulatory Equity Act of 2005, the name of Federal Order 131 changed from the "Arizona-Las Vegas Order" to the "Arizona Order" and Clark County, Nevada, was removed from the marketing area effective May 1, 2006.

Figure A-1
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE BUTTERFAT LEVELS
PACIFIC NORTHWEST ORDER
2006

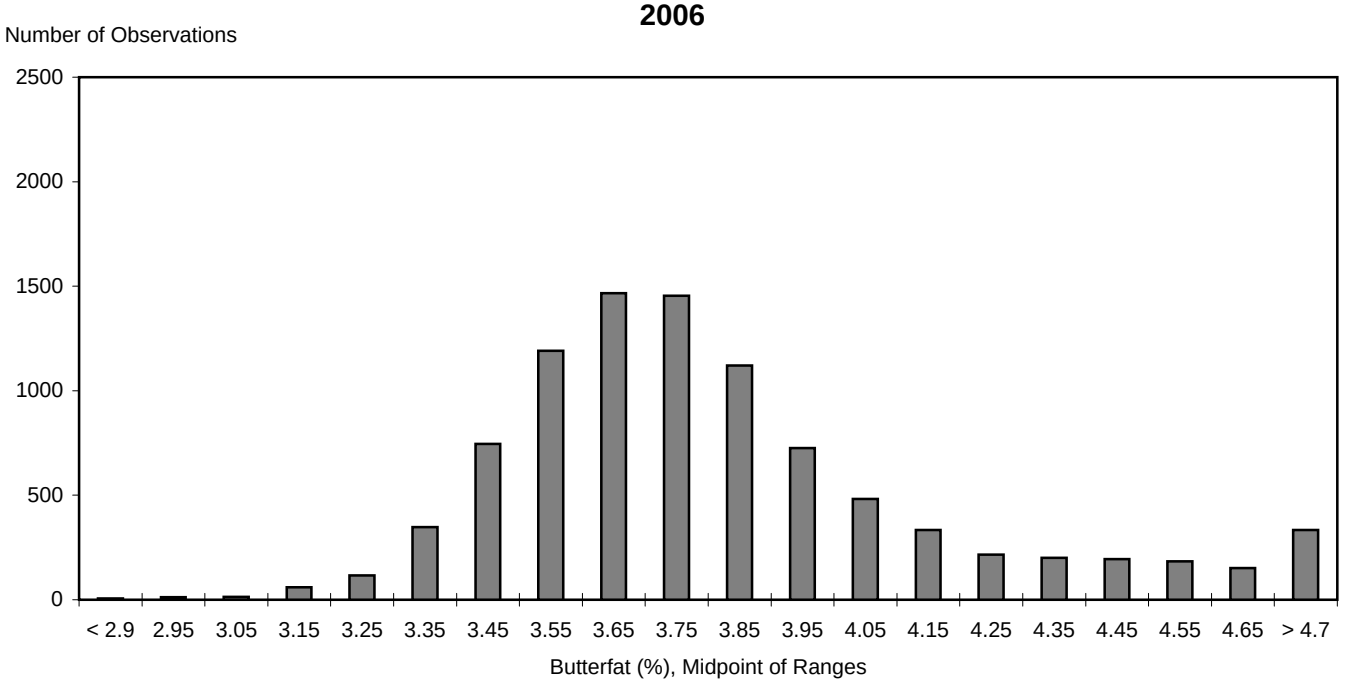


Figure A-2
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE PROTEIN LEVELS
PACIFIC NORTHWEST ORDER
2006

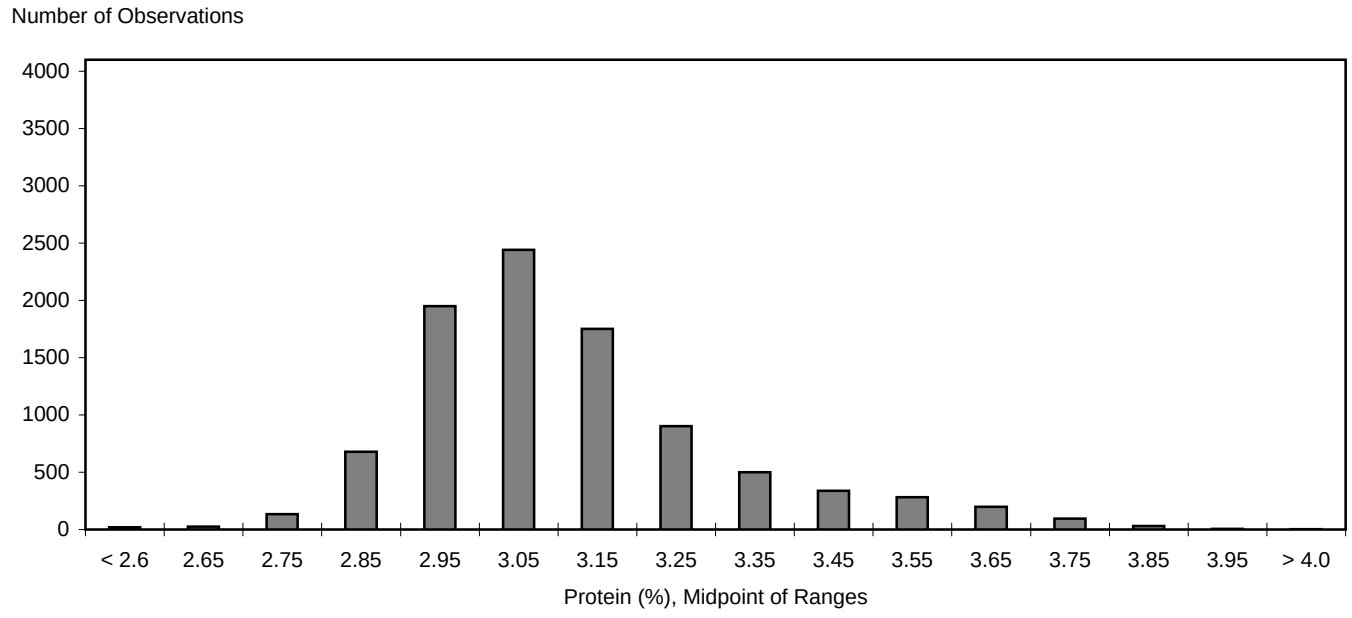


Figure A-3
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE OTHER SOLIDS LEVELS: PACIFIC NORTHWEST ORDER
2006

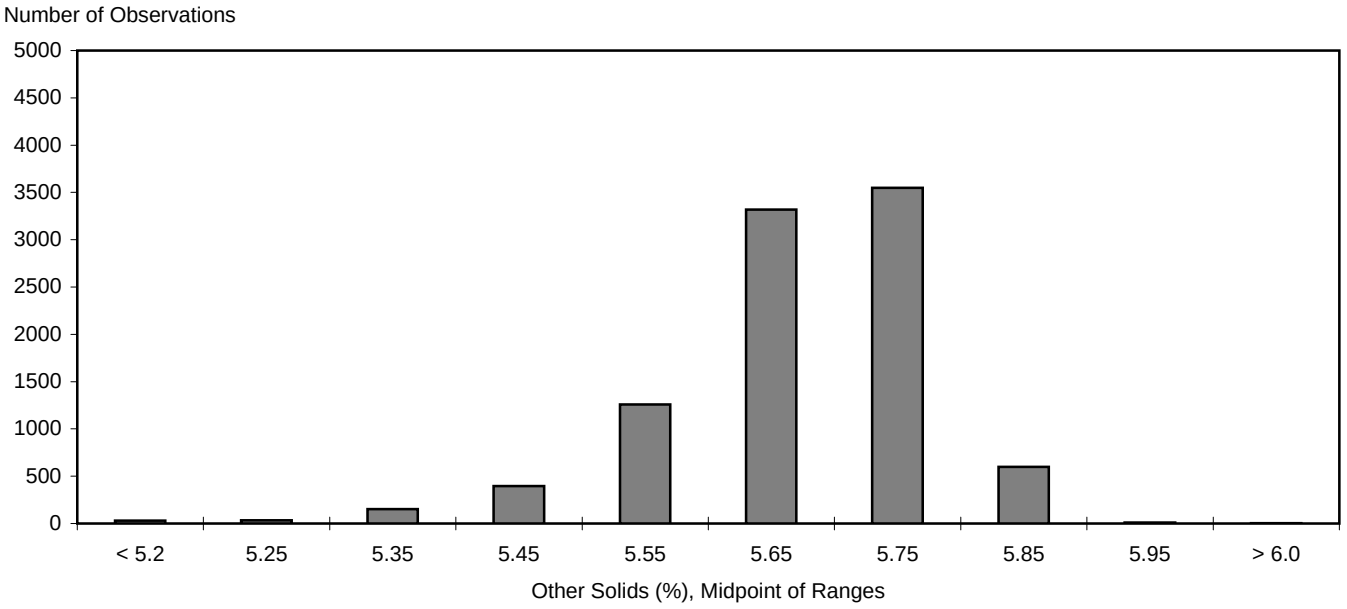
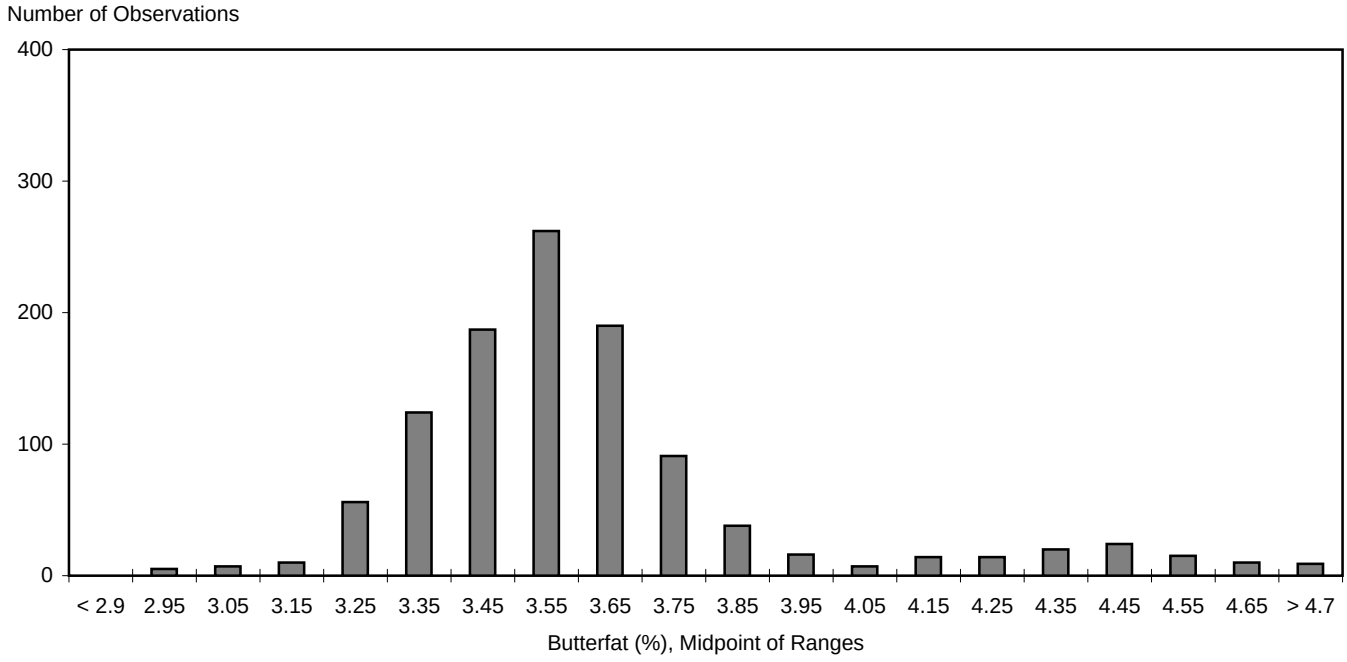


Figure A-4
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE BUTTERFAT LEVELS
ARIZONA ORDER*
2006

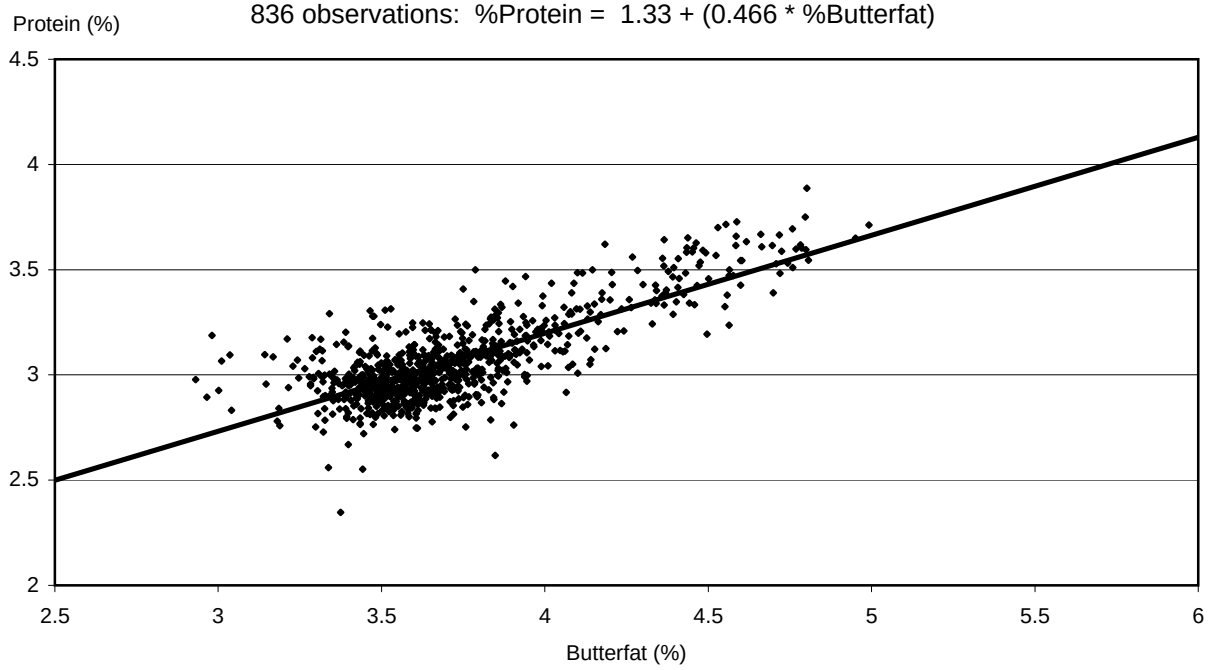


* Due to the implementation of the Milk Regulatory Equity Act of 2005, the name of Federal Order 131 changed from the "Arizona-Las Vegas Order" to the "Arizona Order" and Clark County, Nevada, was removed from the marketing area effective May 1, 2006.

Figure A-5
SCATTER PLOT OF PROTEIN AND BUTTERFAT
MAY AND NOVEMBER 2006
Pacific Northwest Order

May 2006

836 observations: %Protein = 1.33 + (0.466 * %Butterfat)



November 2006

761 observations: %Protein = 1.50 + (0.430 * %Butterfat)

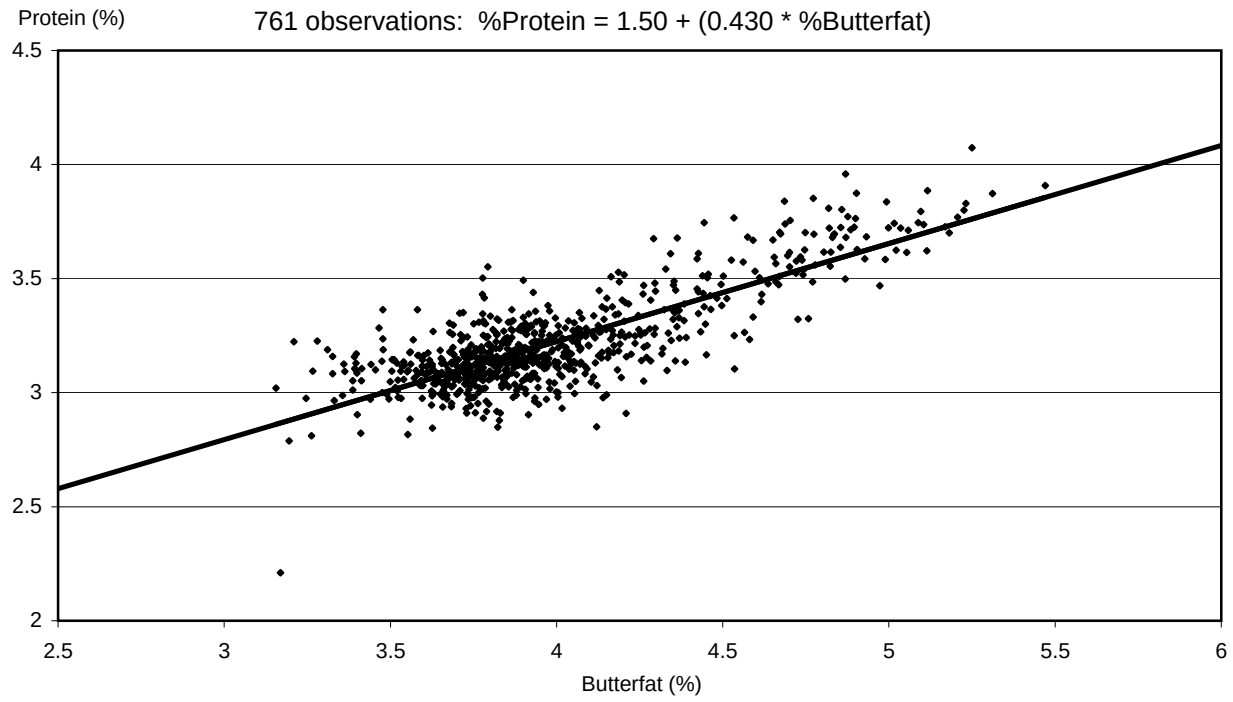
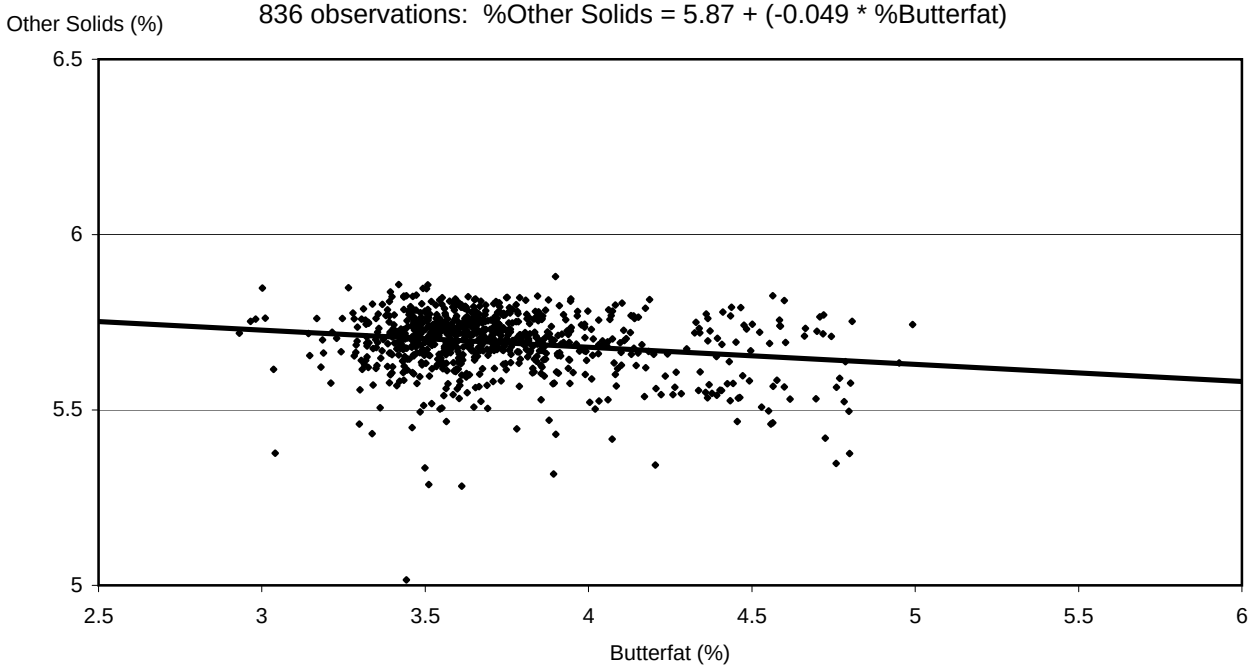


Figure A-6
SCATTER PLOT OF OTHER SOLIDS AND BUTTERFAT
MAY AND NOVEMBER 2006
Pacific Northwest Order

May 2006

836 observations: %Other Solids = 5.87 + (-0.049 * %Butterfat)



November 2006

761 observations: %Other Solids = 5.94 + (-0.075 * %Butterfat)

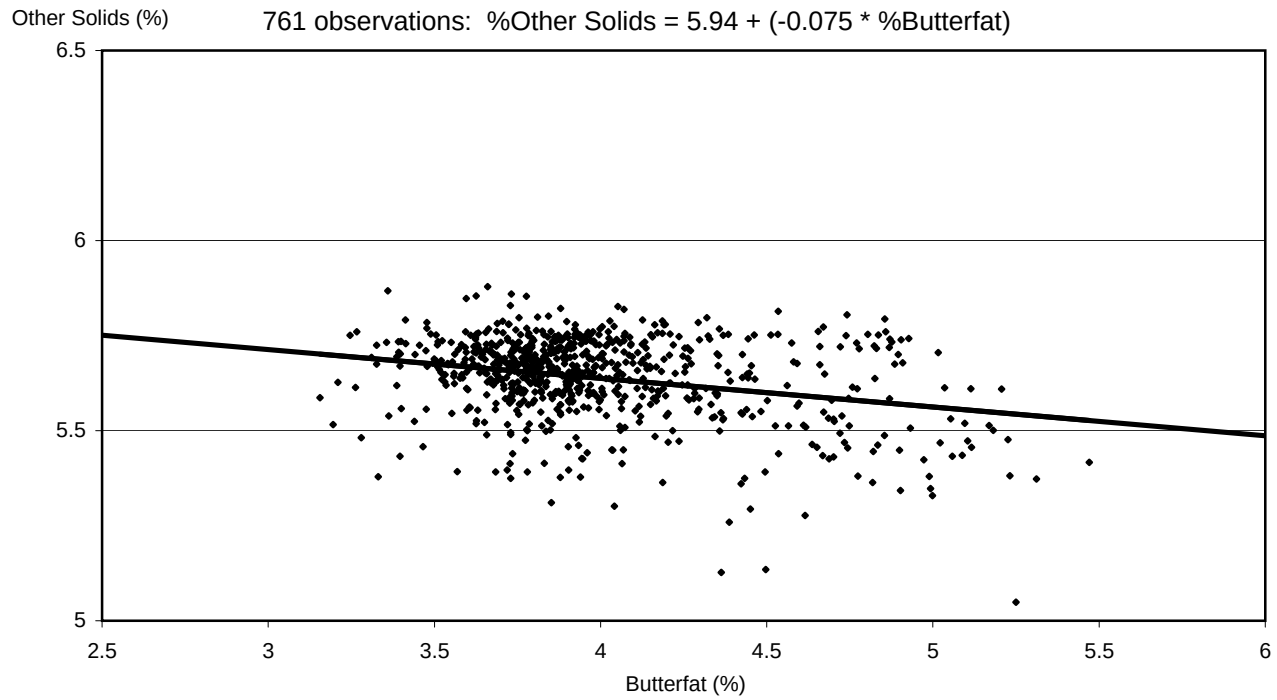
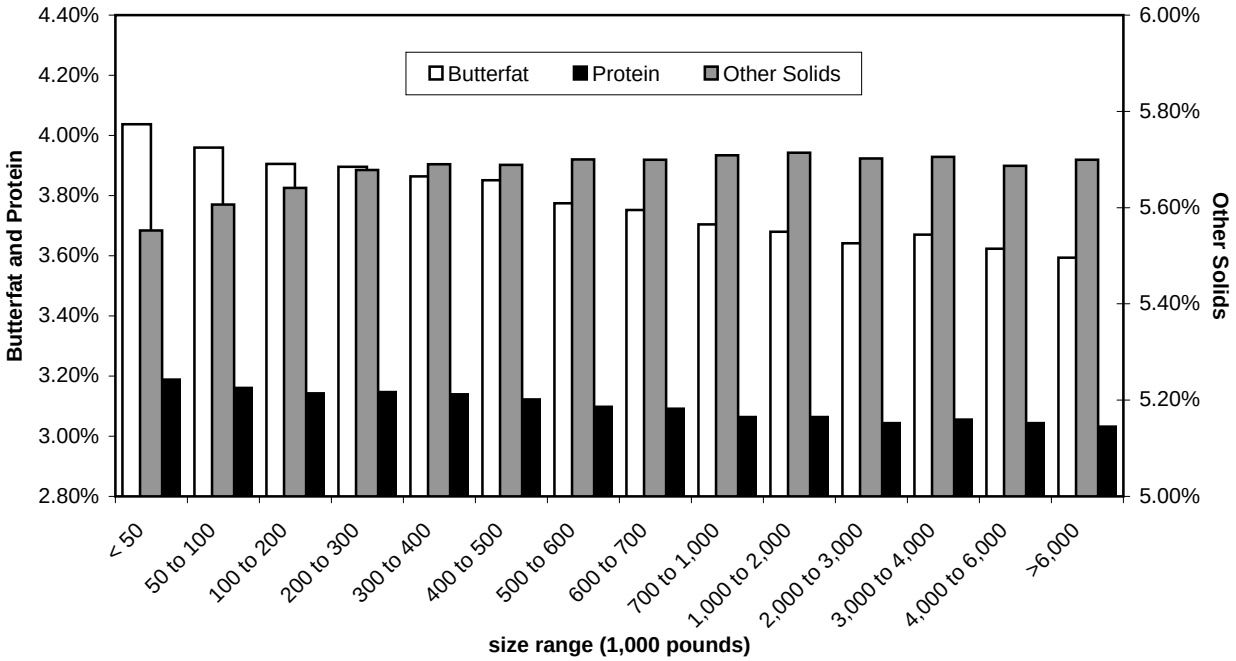
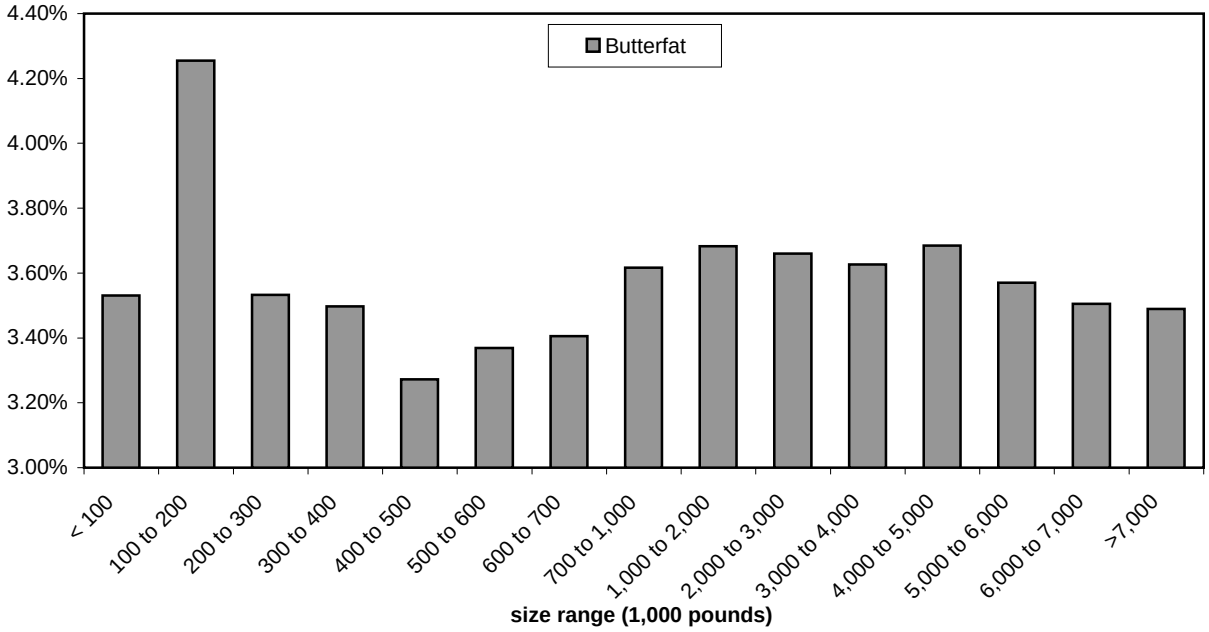


Figure A-7
WEIGHTED AVERAGE COMPONENT LEVELS
BY SIZE-RANGE OF PRODUCER MILK DELIVERIES
2006

Pacific Northwest Order



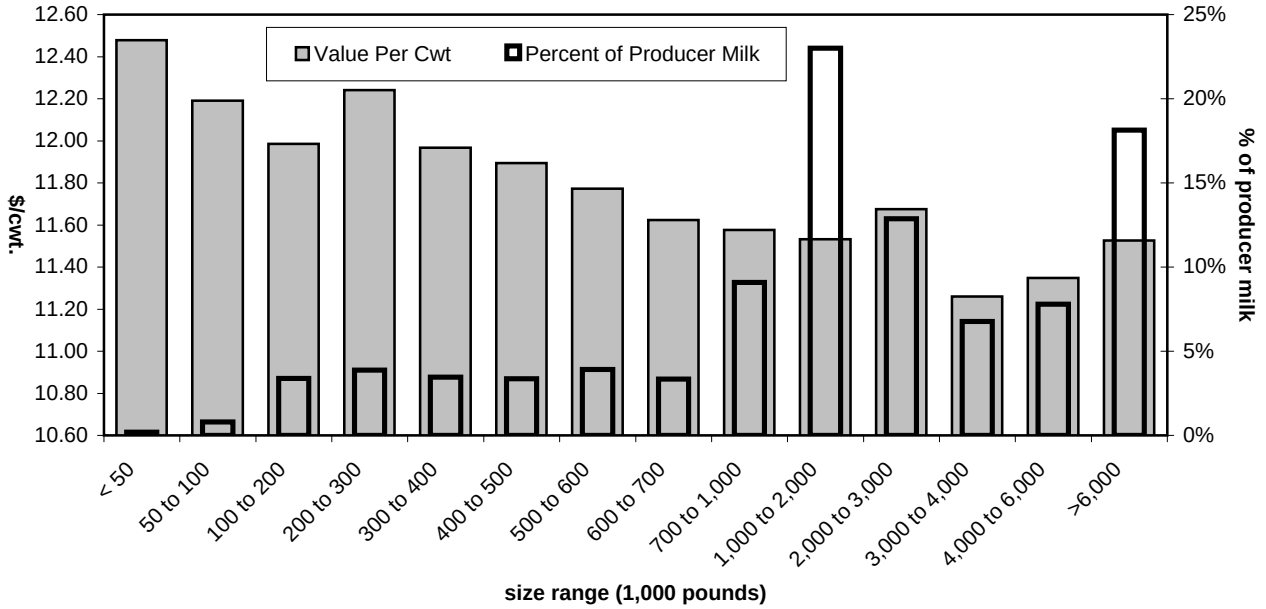
Arizona Order*



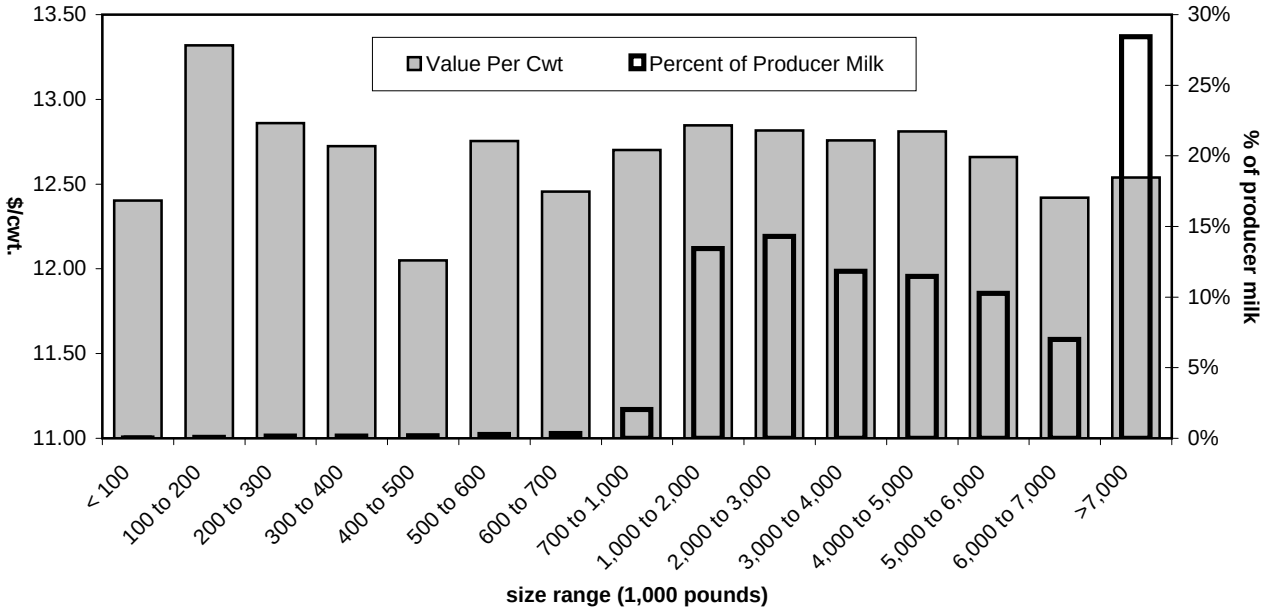
* Due to the implementation of the Milk Regulatory Equity Act of 2005, the name of Federal Order 131 changed from the "Arizona-Las Vegas Order" to the "Arizona Order" and Clark County, Nevada, was removed from the marketing area effective May 1, 2006.

Figure A-8
WEIGHTED AVERAGE VALUES AND PERCENT OF PRODUCER MILK
BY SIZE-RANGE OF PRODUCER MILK DELIVERIES
2006

Pacific Northwest Order

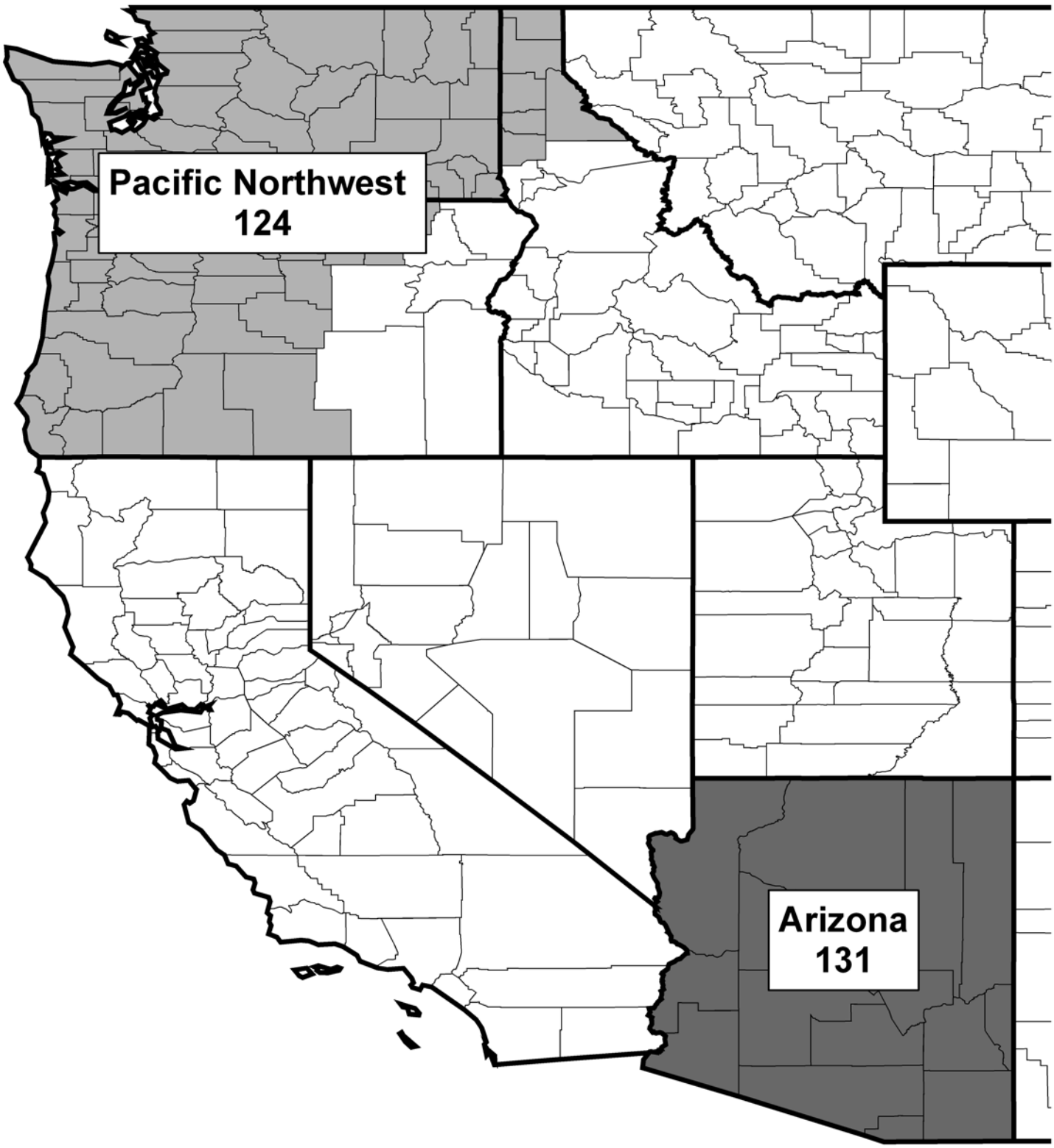


Arizona Order*



* Due to the implementation of the Milk Regulatory Equity Act of 2005, the name of Federal Order 131 changed from the "Arizona-Las Vegas Order" to the "Arizona Order" and Clark County, Nevada, was removed from the marketing area effective May 1, 2006.

MAP A-1
Marketing Area of the Pacific Northwest (FO 124)
and Arizona (FO131) Federal Orders



MAP A-2
Geographic Regions Encompassing The Pacific Northwest and Arizona Order Milk Sheds, 2006