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

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

2000

Staff Paper 01-02

Chris Werner

September 2001

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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) Orders were analyzed for 2000 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 2000, a monthly average total of 1,950 producers were pooled on the Pacific Northwest, Arizona-Las Vegas, and Western Orders. During 2000, these producers delivered 13.9 billion pounds to the three markets. The milk shed of the three Federal orders includes Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Texas, Utah, Washington, and Wyoming.

Major findings of this study include:

1. The 2000 average component levels for the Pacific Northwest Order were 3.65% butterfat, 3.02% true protein, and 5.71% other solids. The 2000 average component levels for the Western Order were 3.61% butterfat, 3.05% true protein, and 5.72% other solids. The 2000 average butterfat level for the Arizona-Las Vegas Order was 3.62%.
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 2000 for protein is $PRO\% = 1.53 + 0.414 * BF\%$, with an R-squared of 0.60. The Western Order's linear regression in 2000 for protein is $PRO\% = 1.75 + 0.366 * BF\%$, with an R-squared of 0.45.
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, with other solids levels appearing to be independent of butterfat levels.

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

2000

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) Orders during 2000. The milk components include butterfat, protein, and other solids. Protein and other solids are not included in any analyses concerning the Arizona-Las Vegas Order because it was not used as a basis for pricing milk in 2000, 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 2000 was valued using Federal order minimum producer prices for the respective orders.

For 2000, a monthly average total of 1,950 producers were pooled on the Pacific Northwest, Arizona-Las Vegas, and Western Orders. During 2000, these producers delivered 13.9 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 0.19 percentage points higher than true protein test levels. In a like manner, other solids levels associated with true protein levels are 0.19 percentage points higher than those associated with crude protein test levels.

The Pacific Northwest Order milk shed has producers located in Washington, Oregon, Idaho, and Northern California. The Western Order milk shed has producers located in Southern Idaho, Eastern Oregon, Utah, Colorado, Wyoming, California, and Nevada. The Arizona-Las Vegas milk shed has producers located in Arizona, California, Texas, New Mexico, Idaho, and Utah. The milk shed of the

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

II. DATA AND METHODOLOGY

The data included in this study comprises all producer milk pooled on the Pacific Northwest, Arizona-Las Vegas, and Western Orders. The data was collected from producer payrolls submitted by handlers to the market administrator's office. Components available for the Pacific Northwest and Western Orders were butterfat, protein, and other solids (other solids is nonfat solids less protein). Protein and other solids are not included for the Arizona-Las Vegas Order because it was not used as a basis for pricing milk in 2000, 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 pooled on the respective order. The exclusion of this milk 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 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. One producer in Wyoming was included in the southern Idaho region (Region 8). Similar climates between the regions and a relatively small amount of milk pooled from Wyoming made this combination logical. Utah, Colorado, and Nevada were combined for reasons of confidentiality. The Arizona, Texas, New Mexico, and 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/Colorado (Region 9), and Arizona/South-Central California/New Mexico/Texas (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 states¹. 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 2000, producers on the Pacific Northwest Order delivered 6,775.6 million pounds. In 2000, not all eligible milk was pooled. (See asterisked months in Table 1.) For 2000, producer milk tested, on average, 3.65% butterfat, 3.02% protein, and 5.71% other solids.

In the Pacific Northwest Order, the butterfat percent decreases in the spring and increases again in the fall and winter. Table 1 shows the monthly and annual average component levels for the Pacific Northwest Order. Milk production per cow typically is less, and animals are fed more stored feed in the fall and winter. In the spring, during the flush of milk production, the feeding of more fresh grass increases the total pounds produced but decreases the percentage butterfat content of milk. The spring flush is additionally impacted by the biological cycle of cows and the increase in temperature in the spring. Butterfat levels in the Pacific Northwest Order in 2000 were the highest in December at 3.76% and lowest in July at 3.55%. The seasonal cycle of protein levels is similar to butterfat but with a lesser degree of variation. Protein levels in 2000 were highest in November at 3.12% and lowest in July at 2.94%. 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 5.73% in May and June, and a low of 5.69% in January and February, and showed very little seasonality.

In 2000, producers associated with the Western Federal Order delivered 4,040.7 million pounds. In 2000, not all eligible milk was pooled. (See asterisked months in Table 2.) For 2000, producer milk tested, on average, 3.61% butterfat, 3.05% protein, and 5.72% other solids.

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

Table 1
Monthly Component Levels
Pacific Northwest Order
2000

| Month | Butterfat - percent - | Protein - percent - | Other Solids - percent - |
|------------------|--------------------------|------------------------|-----------------------------|
| January | 3.71 | 3.05 | 5.69 |
| February | 3.70 | 3.01 | 5.69 |
| March | 3.68 | 3.02 | 5.71 |
| April | 3.64 | 3.01 | 5.71 |
| May * | 3.58 | 2.96 | 5.73 |
| June * | 3.57 | 2.96 | 5.73 |
| July | 3.55 | 2.94 | 5.72 |
| August | 3.57 | 2.99 | 5.71 |
| September | 3.62 | 3.04 | 5.71 |
| October | 3.66 | 3.09 | 5.71 |
| November * | 3.73 | 3.12 | 5.70 |
| December * | 3.76 | 3.09 | 5.71 |
| Weighted Average | 3.65 | 3.02 | 5.71 |

* Eligible milk not pooled.

Table 2
Monthly Component Levels
Western Order
2000

| Month | Butterfat - percent - | Protein - percent - | Other Solids - percent - |
|------------------|--------------------------|------------------------|-----------------------------|
| January | 3.73 | 3.09 | 5.68 |
| February | 3.68 | 3.05 | 5.70 |
| March | 3.66 | 3.06 | 5.70 |
| April | 3.60 | 3.03 | 5.71 |
| May * | 3.53 | 3.01 | 5.73 |
| June * | 3.49 | 2.97 | 5.76 |
| July * | 3.48 | 2.96 | 5.74 |
| August * | 3.50 | 2.98 | 5.76 |
| September * | 3.59 | 3.07 | 5.75 |
| October * | 3.65 | 3.12 | 5.72 |
| November * | 3.74 | 3.17 | 5.73 |
| December * | 3.72 | 3.13 | 5.71 |
| Weighted Average | 3.61 | 3.05 | 5.72 |

* Eligible milk not pooled.

Table 3
Monthly Component Levels
Arizona-Las Vegas Order
2000

| Month | Butterfat - percent - |
|------------------|--------------------------|
| January | 3.72 |
| February | 3.65 |
| March | 3.63 |
| April | 3.54 |
| May | 3.51 |
| June | 3.55 |
| July | 3.57 |
| August | 3.56 |
| September | 3.56 |
| October | 3.67 |
| November | 3.82 |
| December | 3.73 |
| Weighted Average | 3.62 |

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 2000 were highest in November at 3.74% and lowest in July at 3.48%. Protein levels in 2000 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 had a high of 5.76% in June and August, and a low of 5.68% in January and showed very little seasonality.

In 2000, producers associated with the Arizona-Las Vegas Order delivered 3,105.7 million pounds. For 2000, producer milk tested, on average, 3.62% 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 2000 were highest in November at 3.82% and lowest in May at 3.51%.

For 2000, the weighted average butterfat and protein levels were less than the mean averages for both components. (See Appendix Tables A-1, A-2, and A-3.) The relative levels of the weighted average and the mean would indicate that individual producers who deliver smaller amounts of milk (on a monthly basis) have higher levels of these components in their milk than their larger counterparts. Conversely, on the Pacific Northwest and Western 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.

| Table 4 Component Weighted Average, Mean, Median, Standard Deviation, Minimum, and Maximum Pacific Northwest Order 2000 | | | |
|--|-----------|---------|--------------|
| | Butterfat | Protein | Other Solids |
| | % | % | % |
| Weighted Average | 3.65 | 3.02 | 5.71 |
| Mean | 3.78 | 3.09 | 5.69 |
| Median | 3.71 | 3.04 | 5.70 |
| Standard Deviation | 0.37 | 0.20 | 0.07 |
| Minimum | 2.39 | 2.54 | 4.86 |
| Maximum | 6.27 | 4.37 | 5.98 |

| Table 5 Component Weighted Average, Mean, Median, Standard Deviation, Minimum, and Maximum Western Order 2000 | | | |
|--|-----------|---------|--------------|
| | Butterfat | Protein | Other Solids |
| | % | % | % |
| Weighted Average | 3.61 | 3.05 | 5.72 |
| Mean | 3.69 | 3.10 | 5.70 |
| Median | 3.66 | 3.07 | 5.70 |
| Standard Deviation | 0.31 | 0.17 | 0.09 |
| Minimum | 2.66 | 2.65 | 4.68 |
| Maximum | 6.68 | 3.96 | 6.04 |

| Table 6 Component Weighted Average, Mean, Median, Standard Deviation, Minimum, and Maximum Arizona-Las Vegas Order 2000 | |
|--|-----------|
| | Butterfat |
| | % |
| Weighted Average | 3.62 |
| Mean | 3.65 |
| Median | 3.62 |
| Standard Deviation | 0.27 |
| Minimum | 2.91 |
| Maximum | 4.96 |

During 2000, on the Pacific Northwest Order, producers' individual monthly average butterfat tests ranged from 2.39% to 6.27%; protein tests ranged from 2.54% to 4.37%, and other solids levels ranged from 4.86% to 5.98%. (See Table 4.) Most monthly average component tests are within one standard deviation of the mean². Based on the definition of a standard deviation, most producers had butterfat tests ranging from 3.41% to 4.15%. Similarly, most protein tests ranged from 2.89% to 3.29%, and most other solids tests ranged from 5.62% to 5.76%. (See Appendix Table A-1 for monthly component statistics.)

In 2000, the Western Order butterfat tests ranged from 2.66% to 6.68%, protein tests ranged from 2.65% to 3.96%, and other solids tests ranged from 4.68% to 6.04%. (See Table 5.) Based on the definition of a standard deviation, most producers had butterfat tests ranging from 3.38% to 4.00%. Similarly, most protein tests ranged from 2.93% to 3.27%, and most other solids tests ranged from 5.61% to 5.79%. For monthly component statistics, see Appendix Table A-2.

In 2000, the Arizona-Las Vegas Order butterfat tests ranged from 2.91% to 4.96%. (See Table 6.) Based on the definition of a standard deviation, most producers had butterfat tests ranging from 3.38% to 3.92%.

IV. REGIONAL VARIATION IN MILK COMPONENT LEVELS

An examination of milk component levels on a geographic basis can reveal differences in climate, common management practices, feeds, and other characteristics of dairy operations. 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. Milk pooled on Pacific Northwest, Western, and Arizona-Las Vegas Orders was aggregated based on the location it was produced, not where it was pooled.

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 2000 milk production, average number of producers, and component tests for each region. In 2000, 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 Order 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. The Arizona-Las Vegas Order is represented by Region 10.

In general, comparing all the regions, Region 10 had the most milk pooled in 2000, with 3.1 billion pounds, while Region 1 had the most producers (478 producers on average). Average milk production per producer was the highest in Region 10 with an average of 2.2 million pounds per producer. The

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

highest butterfat levels in 2000 were in Region 4 with annual tests of 3.82%, while Region 3 had the lowest annual butterfat test of 3.55%. Protein levels in Regions 5 and 7 (3.09%) and other solids levels in Region 3 (5.73%) were the highest for each of those components.

| Table 7 | | | |
|--|---------------|--------------------------------------|---------------|
| Various Statistics by Region For 2000 | | | |
| Region 1 (Western Washington) | | Region 2 (Central Washington) | |
| Milk Production | 2,859,388,413 | Milk Production | 1,821,865,279 |
| Average Number of Producers | 478 | Average Number of Producers | 107 |
| Average Pounds Per Producer | 498,412 | Average Pounds Per Producer | 1,421,112 |
| Butterfat Test | 3.64% | Butterfat Test | 3.57% |
| Protein Test | 3.01% | Protein Test | 2.98% |
| Other Solids Test | 5.70% | Other Solids Test | 5.71% |
| Region 3 (Eastern Washington) | | Region 4 (Northern Idaho) | |
| Milk Production | 332,145,734 | Milk Production | 20,871,144 |
| Average Number of Producers | 58 | Average Number of Producers | 17 |
| Average Pounds Per Producer | 479,979 | Average Pounds Per Producer | 103,322 |
| Butterfat Test | 3.55% | Butterfat Test | 3.82% |
| Protein Test | 3.01% | Protein Test | 3.04% |
| Other Solids Test | 5.73% | Other Solids Test | 5.70% |
| Region 5 (Western Oregon) | | Region 6 (Central Oregon) | |
| Milk Production | 1,466,126,208 | Milk Production | 106,362,790 |
| Average Number of Producers | 308 | Average Number of Producers | 19 |
| Average Pounds Per Producer | 396,465 | Average Pounds Per Producer | 468,559 |
| Butterfat Test | 3.77% | Butterfat Test | 3.73% |
| Protein Test | 3.09% | Protein Test | 2.99% |
| Other Solids Test | 5.72% | Other Solids Test | 5.72% |
| Region 7 (Eastern Oregon) | | Region 8 (Southern Idaho) | |
| Milk Production | 26,540,878 | Milk Production | 2,520,543,059 |
| Average Number of Producers | 18 | Average Number of Producers | 399 |
| Average Pounds Per Producer | 120,640 | Average Pounds Per Producer | 526,539 |
| Butterfat Test | 3.69% | Butterfat Test | 3.59% |
| Protein Test | 3.09% | Protein Test | 3.04% |
| Other Solids Test | 5.72% | Other Solids Test | 5.70% |
| Region 9 (Greater Utah) | | Region 10 (Arizona) | |
| Milk Production | 1,679,861,888 | Milk Production | 3,088,261,304 |
| Average Number of Producers | 428 | Average Number of Producers | 118 |
| Average Pounds Per Producer | 326,821 | Average Pounds Per Producer | 2,190,256 |
| Butterfat Test | 3.63% | Butterfat Test | 3.62% |
| Protein Test | 3.04% | Protein Test | n/a |
| Other Solids Test | 5.70% | Other Solids Test | n/a |

n/a = not applicable

Producer milk, number of producers, and average milk production per producer varied greatly between regions. Small differences in component levels were also evident. In 2000, butterfat levels in Regions 4 and 5 were noticeably higher than the other regions, while Regions 2 and 3 were much lower than the other regions. Protein levels in Region 5 and 7 were 0.08% higher than Regions 1 and 3. Other solids levels by region varied only 0.03% between the high and low for the year 2000.

V. STATISTICAL RELATIONSHIP AMONG MILK COMPONENTS

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

The Pacific Northwest Order had 12,872 observations in 2000, compared to the Western Order's 9,059 observations. The linear regression for protein and butterfat for 2000 varied between the Pacific Northwest and Western Orders. The regression equation calculated for each order was:

$$\begin{array}{ll} \text{Pacific Northwest:} & \text{PRO\%} = 1.5258 + 0.4136 \text{ BF\%} \\ & R^2 = 0.5996 \end{array}$$

$$\begin{array}{ll} \text{Western:} & \text{PRO\%} = 1.7457 + 0.3665 \text{ BF\%} \\ & R^2 = 0.4468 \end{array}$$

The correlation (R^2) between protein and butterfat is slightly higher in the Pacific Northwest Order compared to the Western Order. The Pacific Northwest's slope is slightly steeper, but the intercept is slightly less. Adjusting for the difference in protein testing in years previous to 2000, both equations above are similar to previous Federal order publications³. Appendix Figures A-8 and A-9 show graphical representations of the linear regressions for May and November 2000.

The butterfat and protein regression equations for the Pacific Northwest and Western Orders (Southwestern Idaho-Eastern Oregon prior to January 2000), on a combined basis, were done for 1997, 1998, 1999, and 2000. (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 January 2000, changed

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

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

Table 8
Pacific Northwest and Western Federal Order*
Comparison of Regression Results: Butterfat Level as a Predictor of Protein Levels
1997 through 2000

| <u>Year</u> | <u>Equation</u> | <u>Correlation</u> |
|-------------|--------------------------------|------------------------|
| 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 |

* 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 pooled on the Pacific Northwest Order in 2000 averaged \$11.92 per hundredweight. The value of each component comprising the \$11.92 per hundredweight was: \$4.54 for butterfat; \$5.17 for protein; \$0.29 for other solids; and a producer price differential of \$1.92.

The value of producers' milk pooled on the Western Order in 2000 averaged \$11.40 per hundredweight. The value of each component comprising the \$11.40 per hundredweight was: \$4.50 for butterfat; \$5.17 for protein; \$0.29 for other solids; and a producer price differential of \$1.44.

The value of producers' milk pooled on the Arizona-Las Vegas Order in 2000 averaged \$11.96 per hundredweight. The value of skim and butterfat portions of the \$11.96 per hundredweight was: \$4.48 for butterfat; and \$7.48 for skim.

There is an apparent relationship between the size-range of producers' production and the component levels in their milk. The difference in component levels, in turn, translates to a 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-7 and Figure A-12. For the Pacific Northwest Order, on average, using 2000 Federal order prices, producers with less than 50,000 pounds of production received more per hundredweight (\$12.77), than other producers. Producers with more than three million pounds of production averaged the lowest amount per hundredweight, at \$11.65. Producers on the Western Order followed the same pattern as producers on the Pacific Northwest Order. Producers with less than 50,000 pounds of production pooled on the Western Order received more per hundredweight, \$11.89, than other producers. Producers with more than three million pounds of production averaged the lowest amount per hundredweight, at \$11.31. This relationship is generally indicative of the fact that smaller herds typically have higher component levels than larger herds. On the Arizona Las-Vegas Order, using skim-butterfat values, a relationship between size-range and value per hundredweight was less evident. The Arizona-Las Vegas Order data was broken down further for producers over one million pounds, into smaller increments (e.g. 1-2 million pounds, 2-3 million pounds, 3-4 million pounds, etc.) to determine whether the size-range categories used masked any relationships. Using smaller increments does indicate producers pooled on the Arizona-Las Vegas Order who have more milk deliveries have a lower value of milk; the relationship, however, is not as significant as the other two orders noted above.

VII. SUMMARY

This paper analyzes milk components associated with the Pacific Northwest, Arizona-Las Vegas, and Western Orders. Handlers regulated under the Pacific Northwest and Western Orders report butterfat, protein, and other solids. Handlers regulated under the Arizona-Las Vegas Order report butterfat, only. For each order, producer information was collected from handler payrolls submitted to the market administrator's office. Component levels were examined using a variety 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 2000 were: 3.65% butterfat, 3.02% protein, and 5.71% other solids. In 2000, butterfat and protein percentages peaked in December 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 three orders.

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

$$\text{Protein} = 1.5258 + 0.4136 * \text{Butterfat} \quad (R^2 = 0.5996).$$

In 2000, the Federal order weighted average price received for milk was \$11.92 per hundredweight, at test.

Weighted average component levels for the Western Order in 2000 were: 3.61% butterfat, 3.05% protein, and 5.72% other solids. In 2000, butterfat and protein percentages peaked in November and reached a low in July. Other solids, as in the Pacific Northwest Order, had very little seasonal change.

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

$$\text{Protein} = 1.7457 + 0.3665 * \text{Butterfat} \quad (R^2 = 0.4468).$$

In 2000, the Federal order weighted average price received for milk was \$11.40 per hundredweight, at test.

The annual average butterfat level for the Arizona-Las Vegas Order in 2000 was 3.62%. In 2000, butterfat levels peaked in November and reached a low May. In 2000, the Federal order weighted average price received for milk was \$11.96 per hundredweight, at test.

APPENDIX

Table A-1

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

2000

Butterfat

| <u>Month</u> | <u>Weighted Average</u> - % - | <u>Mean</u> - % - | <u>Standard Deviation</u> - % - | <u>Median</u> - % - | <u>Minimum</u> - % - | <u>Maximum</u> - % - | <u>Number of Observations</u> |
|--------------|--------------------------------------|----------------------|--|------------------------|-------------------------|-------------------------|-----------------------------------|
| January | 3.71 | 3.87 | 0.39 | 3.79 | 2.39 | 6.27 | 1,073 |
| February | 3.70 | 3.85 | 0.37 | 3.77 | 2.41 | 5.48 | 1,073 |
| March | 3.68 | 3.83 | 0.37 | 3.75 | 2.43 | 5.32 | 1,064 |
| April | 3.64 | 3.77 | 0.35 | 3.70 | 2.51 | 5.19 | 1,071 |
| May | 3.58 | 3.70 | 0.37 | 3.61 | 2.65 | 5.11 | 850 |
| June | 3.57 | 3.69 | 0.36 | 3.61 | 2.78 | 5.02 | 848 |
| July | 3.55 | 3.64 | 0.33 | 3.58 | 2.66 | 5.05 | 1,039 |
| August | 3.57 | 3.69 | 0.33 | 3.63 | 2.59 | 5.12 | 1,041 |
| September | 3.62 | 3.73 | 0.35 | 3.67 | 2.58 | 5.45 | 1,297 |
| October | 3.66 | 3.79 | 0.37 | 3.71 | 2.84 | 5.82 | 1,252 |
| November | 3.73 | 3.87 | 0.39 | 3.79 | 2.72 | 5.99 | 1,144 |
| December | 3.76 | 3.89 | 0.37 | 3.81 | 2.83 | 5.78 | 1,120 |
| For the Year | 3.65 | 3.78 | 0.37 | 3.71 | 2.39 | 6.27 | 12,872 |

Protein

| <u>Month</u> | <u>Weighted Average</u> - % - | <u>Mean</u> - % - | <u>Standard Deviation</u> - % - | <u>Median</u> - % - | <u>Minimum</u> - % - | <u>Maximum</u> - % - | <u>Number of Observations</u> |
|--------------|--------------------------------------|----------------------|--|------------------------|-------------------------|-------------------------|-----------------------------------|
| January | 3.05 | 3.11 | 0.20 | 3.06 | 2.62 | 4.37 | 1,073 |
| February | 3.01 | 3.07 | 0.20 | 3.02 | 2.62 | 3.83 | 1,073 |
| March | 3.02 | 3.08 | 0.19 | 3.03 | 2.63 | 4.01 | 1,064 |
| April | 3.01 | 3.07 | 0.19 | 3.02 | 2.55 | 3.89 | 1,071 |
| May | 2.96 | 3.04 | 0.21 | 2.99 | 2.54 | 3.79 | 850 |
| June | 2.96 | 3.03 | 0.19 | 2.98 | 2.67 | 3.77 | 848 |
| July | 2.94 | 2.99 | 0.17 | 2.95 | 2.57 | 3.67 | 1,039 |
| August | 2.99 | 3.04 | 0.17 | 3.00 | 2.68 | 3.79 | 1,041 |
| September | 3.04 | 3.09 | 0.18 | 3.06 | 2.70 | 4.09 | 1,297 |
| October | 3.09 | 3.14 | 0.19 | 3.10 | 2.63 | 4.25 | 1,252 |
| November | 3.12 | 3.18 | 0.20 | 3.14 | 2.79 | 4.16 | 1,144 |
| December | 3.09 | 3.16 | 0.20 | 3.12 | 2.71 | 4.03 | 1,120 |
| For the Year | 3.02 | 3.09 | 0.20 | 3.04 | 2.54 | 4.37 | 12,872 |

Table A-1 (Continued)

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

2000

| <u>Month</u> | <u>Other Solids</u> | | | | | | <u>Number of Observations</u> |
|--------------|----------------------------------|----------------------|------------------------------------|------------------------|-------------------------|-------------------------|-------------------------------|
| | <u>Weighted Average</u> - % - | <u>Mean</u> - % - | <u>Standard Deviation</u> - % - | <u>Median</u> - % - | <u>Minimum</u> - % - | <u>Maximum</u> - % - | |
| January | 5.69 | 5.67 | 0.09 | 5.68 | 4.86 | 5.92 | 1,073 |
| February | 5.69 | 5.67 | 0.09 | 5.69 | 4.99 | 5.94 | 1,073 |
| March | 5.71 | 5.69 | 0.07 | 5.70 | 5.23 | 5.92 | 1,064 |
| April | 5.71 | 5.70 | 0.07 | 5.70 | 5.22 | 5.95 | 1,071 |
| May | 5.73 | 5.72 | 0.06 | 5.71 | 5.22 | 5.98 | 850 |
| June | 5.73 | 5.72 | 0.06 | 5.72 | 5.40 | 5.97 | 848 |
| July | 5.72 | 5.70 | 0.05 | 5.71 | 5.39 | 5.90 | 1,039 |
| August | 5.71 | 5.69 | 0.06 | 5.69 | 5.27 | 5.97 | 1,041 |
| September | 5.71 | 5.70 | 0.07 | 5.70 | 5.16 | 5.96 | 1,297 |
| October | 5.71 | 5.69 | 0.08 | 5.70 | 4.94 | 5.95 | 1,252 |
| November | 5.70 | 5.67 | 0.08 | 5.69 | 5.21 | 5.93 | 1,144 |
| December | 5.71 | 5.68 | 0.08 | 5.70 | 5.13 | 5.91 | 1,120 |
| For the Year | 5.71 | 5.69 | 0.07 | 5.70 | 4.86 | 5.98 | 12,872 |

Table A-2

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

2000

| Butterfat | | | | | | | |
|--------------|--------------------------------------|----------------------|--|------------------------|-------------------------|-------------------------|-----------------------------------|
| <u>Month</u> | <u>Weighted Average</u> - % - | <u>Mean</u> - % - | <u>Standard Deviation</u> - % - | <u>Median</u> - % - | <u>Minimum</u> - % - | <u>Maximum</u> - % - | <u>Number of Observations</u> |
| January | 3.73 | 3.82 | 0.30 | 3.77 | 3.08 | 5.28 | 701 |
| February | 3.68 | 3.76 | 0.29 | 3.72 | 2.96 | 5.13 | 718 |
| March | 3.66 | 3.73 | 0.28 | 3.70 | 2.96 | 5.06 | 751 |
| April | 3.60 | 3.66 | 0.26 | 3.64 | 2.81 | 5.02 | 775 |
| May | 3.53 | 3.58 | 0.26 | 3.56 | 2.70 | 4.81 | 769 |
| June | 3.49 | 3.52 | 0.25 | 3.50 | 2.75 | 4.67 | 760 |
| July | 3.48 | 3.52 | 0.25 | 3.49 | 2.80 | 4.77 | 756 |
| August | 3.50 | 3.56 | 0.27 | 3.54 | 2.76 | 5.08 | 766 |
| September | 3.59 | 3.67 | 0.29 | 3.64 | 2.66 | 5.01 | 764 |
| October | 3.65 | 3.76 | 0.30 | 3.72 | 2.88 | 5.20 | 751 |
| November | 3.74 | 3.85 | 0.33 | 3.81 | 2.84 | 6.19 | 784 |
| December | 3.72 | 3.85 | 0.33 | 3.80 | 2.92 | 6.68 | 764 |
| For the Year | 3.61 | 3.69 | 0.31 | 3.66 | 2.66 | 6.68 | 9,059 |

| Protein | | | | | | | |
|--------------|--------------------------------------|----------------------|--|------------------------|-------------------------|-------------------------|-----------------------------------|
| <u>Month</u> | <u>Weighted Average</u> - % - | <u>Mean</u> - % - | <u>Standard Deviation</u> - % - | <u>Median</u> - % - | <u>Minimum</u> - % - | <u>Maximum</u> - % - | <u>Number of Observations</u> |
| January | 3.09 | 3.15 | 0.17 | 3.12 | 2.75 | 3.96 | 701 |
| February | 3.05 | 3.10 | 0.16 | 3.08 | 2.71 | 3.88 | 718 |
| March | 3.06 | 3.10 | 0.15 | 3.08 | 2.75 | 3.80 | 751 |
| April | 3.03 | 3.06 | 0.14 | 3.04 | 2.70 | 3.72 | 775 |
| May | 3.01 | 3.03 | 0.14 | 3.01 | 2.65 | 3.69 | 769 |
| June | 2.97 | 3.00 | 0.14 | 2.98 | 2.67 | 3.65 | 760 |
| July | 2.96 | 3.00 | 0.14 | 2.98 | 2.67 | 3.67 | 756 |
| August | 2.98 | 3.01 | 0.14 | 3.00 | 2.71 | 3.68 | 766 |
| September | 3.07 | 3.11 | 0.15 | 3.09 | 2.79 | 3.86 | 764 |
| October | 3.12 | 3.17 | 0.15 | 3.15 | 2.84 | 3.92 | 751 |
| November | 3.17 | 3.23 | 0.17 | 3.20 | 2.81 | 3.96 | 784 |
| December | 3.13 | 3.20 | 0.17 | 3.17 | 2.74 | 3.96 | 764 |
| For the Year | 3.05 | 3.10 | 0.17 | 3.07 | 2.65 | 3.96 | 9,059 |

Table A-2 (Continued)

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

2000

| <u>Month</u> | <u>Other Solids</u> | | | | | | <u>Number of Observations</u> |
|--------------|----------------------------------|----------------------|------------------------------------|------------------------|-------------------------|-------------------------|-------------------------------|
| | <u>Weighted Average</u> - % - | <u>Mean</u> - % - | <u>Standard Deviation</u> - % - | <u>Median</u> - % - | <u>Minimum</u> - % - | <u>Maximum</u> - % - | |
| January | 5.68 | 5.66 | 0.08 | 5.67 | 4.96 | 5.87 | 701 |
| February | 5.70 | 5.67 | 0.08 | 5.69 | 5.14 | 5.90 | 718 |
| March | 5.70 | 5.67 | 0.08 | 5.69 | 5.16 | 5.88 | 751 |
| April | 5.71 | 5.69 | 0.08 | 5.70 | 5.29 | 5.91 | 775 |
| May | 5.73 | 5.71 | 0.08 | 5.71 | 5.15 | 5.90 | 769 |
| June | 5.76 | 5.75 | 0.08 | 5.76 | 5.09 | 5.98 | 760 |
| July | 5.74 | 5.72 | 0.08 | 5.74 | 5.11 | 5.94 | 756 |
| August | 5.76 | 5.72 | 0.09 | 5.73 | 5.21 | 6.04 | 766 |
| September | 5.75 | 5.71 | 0.09 | 5.72 | 5.05 | 5.98 | 764 |
| October | 5.72 | 5.69 | 0.08 | 5.69 | 5.13 | 5.89 | 751 |
| November | 5.73 | 5.68 | 0.10 | 5.69 | 4.77 | 5.95 | 784 |
| December | 5.71 | 5.68 | 0.10 | 5.69 | 4.68 | 5.89 | 764 |
| For the Year | 5.72 | 5.70 | 0.09 | 5.70 | 4.68 | 6.04 | 9,059 |

Table A-3

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

2000

| <u>Month</u> | Butterfat | | | | | | <u>Number of Observations</u> |
|--------------|-----------------------------|-------------|-------------------------------|---------------|----------------|----------------|-----------------------------------|
| | <u>Weighted Average</u> | <u>Mean</u> | <u>Standard Deviation</u> | <u>Median</u> | <u>Minimum</u> | <u>Maximum</u> | |
| | - % - | - % - | - % - | - % - | - % - | - % - | |
| January | 3.72 | 3.74 | 0.25 | 3.70 | 3.29 | 4.96 | 117 |
| February | 3.65 | 3.67 | 0.24 | 3.64 | 3.12 | 4.80 | 120 |
| March | 3.63 | 3.66 | 0.25 | 3.63 | 3.26 | 4.78 | 118 |
| April | 3.54 | 3.58 | 0.25 | 3.54 | 3.10 | 4.68 | 118 |
| May | 3.51 | 3.54 | 0.25 | 3.50 | 3.12 | 4.59 | 127 |
| June | 3.55 | 3.57 | 0.25 | 3.55 | 2.91 | 4.60 | 129 |
| July | 3.57 | 3.58 | 0.24 | 3.54 | 3.07 | 4.60 | 130 |
| August | 3.56 | 3.58 | 0.24 | 3.56 | 2.95 | 4.61 | 129 |
| September | 3.56 | 3.59 | 0.24 | 3.57 | 3.14 | 4.64 | 125 |
| October | 3.67 | 3.71 | 0.26 | 3.66 | 3.28 | 4.75 | 116 |
| November | 3.82 | 3.86 | 0.28 | 3.81 | 3.50 | 4.96 | 117 |
| December | 3.73 | 3.79 | 0.29 | 3.72 | 3.20 | 4.91 | 118 |
| For the Year | 3.62 | 3.65 | 0.27 | 3.62 | 2.91 | 4.96 | 1,464 |

Table A-4

**WEIGHTED AVERAGE COMPONENT LEVELS BY REGION
2000**

Butterfat

| | <u>Region 1</u> | <u>No.*</u> | <u>Region 2</u> | <u>No.*</u> | <u>Region 3</u> | <u>No.*</u> | <u>Region 4</u> | <u>No.*</u> | <u>Region 5</u> | <u>No.*</u> |
|--------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|
| | -% - | | -% - | | -% - | | -% - | | -% - | |
| January | 3.70 | 550 | 3.66 | 109 | 3.61 | 58 | 3.86 | 18 | 3.81 | 320 |
| February | 3.68 | 548 | 3.66 | 109 | 3.61 | 59 | 3.87 | 18 | 3.80 | 320 |
| March | 3.67 | 544 | 3.60 | 108 | 3.58 | 59 | 3.84 | 18 | 3.81 | 316 |
| April | 3.65 | 545 | 3.54 | 109 | 3.53 | 60 | 3.81 | 18 | 3.77 | 320 |
| May | 3.58 | 328 | 3.46 | 106 | 3.48 | 59 | 3.70 | 18 | 3.72 | 320 |
| June | 3.58 | 329 | 3.47 | 107 | 3.47 | 58 | 3.72 | 17 | 3.69 | 318 |
| July | 3.55 | 535 | 3.48 | 107 | 3.49 | 56 | 3.70 | 16 | 3.65 | 301 |
| August | 3.59 | 533 | 3.49 | 108 | 3.47 | 56 | 3.76 | 16 | 3.69 | 300 |
| September | 3.62 | 527 | 3.52 | 104 | 3.49 | 57 | 3.82 | 16 | 3.76 | 298 |
| October | 3.65 | 523 | 3.58 | 105 | 3.55 | 57 | 3.89 | 16 | 3.80 | 297 |
| November | 3.70 | 396 | 3.67 | 105 | 3.64 | 57 | 3.92 | 16 | 3.88 | 294 |
| December | 3.71 | 379 | 3.73 | 105 | 3.70 | 56 | 3.93 | 15 | 3.88 | 294 |
| For the Year | 3.64 | 5,737 | 3.57 | 1,282 | 3.55 | 692 | 3.82 | 202 | 3.77 | 3,698 |

| | <u>Region 6</u> | <u>No.*</u> | <u>Region 7</u> | <u>No.*</u> | <u>Region 8</u> | <u>No.*</u> | <u>Region 9</u> | <u>No.*</u> | <u>Region 10</u> | <u>No.*</u> |
|--------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|------------------|-------------|
| | -% - | | -% - | | -% - | | -% - | | -% - | |
| January | 3.81 | 18 | 3.94 | 19 | 3.71 | 301 | 3.74 | 381 | 3.72 | 117 |
| February | 3.78 | 19 | 3.89 | 19 | 3.67 | 321 | 3.69 | 378 | 3.65 | 120 |
| March | 3.78 | 19 | 3.83 | 19 | 3.65 | 355 | 3.67 | 377 | 3.63 | 118 |
| April | 3.72 | 19 | 3.76 | 19 | 3.60 | 358 | 3.61 | 398 | 3.54 | 118 |
| May | 3.66 | 19 | 3.67 | 18 | 3.52 | 363 | 3.55 | 398 | 3.51 | 117 |
| June | 3.66 | 19 | 3.61 | 18 | 3.49 | 362 | 3.49 | 392 | 3.55 | 117 |
| July | 3.59 | 19 | 3.57 | 17 | 3.47 | 372 | 3.49 | 385 | 3.57 | 117 |
| August | 3.61 | 19 | 3.34 | 17 | 3.49 | 373 | 3.52 | 396 | 3.56 | 118 |
| September | 3.71 | 19 | 3.44 | 17 | 3.56 | 494 | 3.62 | 538 | 3.56 | 116 |
| October | 3.76 | 19 | 3.47 | 17 | 3.61 | 467 | 3.69 | 502 | 3.67 | 116 |
| November | 3.82 | 19 | 3.42 | 20 | 3.71 | 511 | 3.79 | 509 | 3.82 | 118 |
| December | 3.84 | 19 | 3.48 | 20 | 3.69 | 510 | 3.76 | 486 | 3.73 | 118 |
| For the Year | 3.73 | 227 | 3.69 | 220 | 3.59 | 4,787 | 3.63 | 5,140 | 3.62 | 1,410 |

Table A-4 (Continued)

**WEIGHTED AVERAGE COMPONENT LEVELS BY REGION
2000**

Protein

| | <u>Region 1</u> | <u>No.*</u> | <u>Region 2</u> | <u>No.*</u> | <u>Region 3</u> | <u>No.*</u> | <u>Region 4</u> | <u>No.*</u> | <u>Region 5</u> | <u>No.*</u> |
|--------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|------------------|-------------|
| | -% - | | -% - | | -% - | | -% - | | -% - | |
| January | 3.03 | 550 | 3.04 | 109 | 3.04 | 58 | 3.04 | 18 | 3.12 | 320 |
| February | 2.99 | 548 | 2.99 | 109 | 3.02 | 59 | 3.01 | 18 | 3.09 | 320 |
| March | 3.00 | 544 | 2.99 | 108 | 3.02 | 59 | 3.01 | 18 | 3.10 | 316 |
| April | 3.00 | 545 | 2.96 | 109 | 2.99 | 60 | 2.99 | 18 | 3.09 | 320 |
| May | 2.97 | 328 | 2.89 | 106 | 2.92 | 59 | 2.95 | 18 | 3.05 | 320 |
| June | 2.96 | 329 | 2.89 | 107 | 2.92 | 58 | 2.96 | 17 | 3.05 | 318 |
| July | 2.94 | 535 | 2.88 | 107 | 2.90 | 56 | 2.96 | 16 | 3.02 | 301 |
| August | 3.00 | 533 | 2.95 | 108 | 2.98 | 56 | 3.05 | 16 | 3.06 | 300 |
| September | 3.03 | 527 | 3.01 | 104 | 3.05 | 57 | 3.12 | 16 | 3.11 | 298 |
| October | 3.06 | 523 | 3.07 | 105 | 3.11 | 57 | 3.14 | 16 | 3.15 | 297 |
| November | 3.09 | 396 | 3.10 | 105 | 3.13 | 57 | 3.16 | 16 | 3.18 | 294 |
| December | 3.05 | 379 | 3.07 | 105 | 3.10 | 56 | 3.12 | 15 | 3.14 | 294 |
| For the Year | 3.01 | 5,737 | 2.98 | 1,282 | 3.01 | 692 | 3.04 | 202 | 3.09 | 3,698 |
| | <u>Region 6</u> | <u>No.*</u> | <u>Region 7</u> | <u>No.*</u> | <u>Region 8</u> | <u>No.*</u> | <u>Region 9</u> | <u>No.*</u> | <u>Region 10</u> | <u>No.*</u> |
| | -% - | | -% - | | -% - | | -% - | | -% - | |
| January | 2.99 | 18 | 3.19 | 19 | 3.09 | 301 | 3.08 | 381 | N/A | N/A |
| February | 2.98 | 19 | 3.11 | 19 | 3.05 | 321 | 3.05 | 378 | N/A | N/A |
| March | 2.98 | 19 | 3.12 | 19 | 3.07 | 355 | 3.05 | 377 | N/A | N/A |
| April | 2.96 | 19 | 3.09 | 19 | 3.03 | 358 | 3.02 | 398 | N/A | N/A |
| May | 2.93 | 19 | 3.03 | 18 | 3.01 | 363 | 3.00 | 398 | N/A | N/A |
| June | 2.95 | 19 | 3.01 | 18 | 2.96 | 362 | 2.94 | 392 | N/A | N/A |
| July | 2.91 | 19 | 3.00 | 17 | 2.92 | 372 | 2.94 | 385 | N/A | N/A |
| August | 2.92 | 19 | 3.00 | 17 | 2.88 | 373 | 2.94 | 396 | N/A | N/A |
| September | 3.00 | 19 | 3.10 | 17 | 3.05 | 494 | 3.04 | 538 | N/A | N/A |
| October | 3.05 | 19 | 3.21 | 17 | 3.14 | 467 | 3.10 | 502 | N/A | N/A |
| November | 3.09 | 19 | 3.27 | 20 | 3.17 | 511 | 3.16 | 509 | N/A | N/A |
| December | 3.08 | 19 | 3.27 | 20 | 3.14 | 510 | 3.13 | 486 | N/A | N/A |
| For the Year | 2.99 | 227 | 3.09 | 220 | 3.04 | 4,787 | 3.04 | 5,140 | N/A | N/A |

Table A-4 (Continued)

**WEIGHTED AVERAGE COMPONENT LEVELS BY REGION
2000**

Other Solids

| | <u>Region 1</u> | <u>No.*</u> | <u>Region 2</u> | <u>No.*</u> | <u>Region 3</u> | <u>No.*</u> | <u>Region 4</u> | <u>No.*</u> | <u>Region 5</u> | <u>No.*</u> |
|--------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|------------------|-------------|
| | -% - | | -% - | | -% - | | -% - | | -% - | |
| January | 5.67 | 550 | 5.69 | 109 | 5.71 | 58 | 5.70 | 18 | 5.70 | 320 |
| February | 5.68 | 548 | 5.69 | 109 | 5.72 | 59 | 5.69 | 18 | 5.70 | 320 |
| March | 5.70 | 544 | 5.71 | 108 | 5.73 | 59 | 5.71 | 18 | 5.72 | 316 |
| April | 5.70 | 545 | 5.70 | 109 | 5.72 | 60 | 5.70 | 18 | 5.74 | 320 |
| May | 5.72 | 328 | 5.72 | 106 | 5.73 | 59 | 5.70 | 18 | 5.75 | 320 |
| June | 5.72 | 329 | 5.74 | 107 | 5.75 | 58 | 5.72 | 17 | 5.74 | 318 |
| July | 5.72 | 535 | 5.72 | 107 | 5.74 | 56 | 5.71 | 16 | 5.73 | 301 |
| August | 5.70 | 533 | 5.71 | 108 | 5.71 | 56 | 5.70 | 16 | 5.73 | 300 |
| September | 5.70 | 527 | 5.72 | 104 | 5.73 | 57 | 5.70 | 16 | 5.72 | 298 |
| October | 5.70 | 523 | 5.72 | 105 | 5.72 | 57 | 5.71 | 16 | 5.71 | 297 |
| November | 5.68 | 396 | 5.71 | 105 | 5.72 | 57 | 5.69 | 16 | 5.71 | 294 |
| December | 5.70 | 379 | 5.71 | 105 | 5.73 | 56 | 5.71 | 15 | 5.71 | 294 |
| For the Year | 5.70 | 5,737 | 5.71 | 1,282 | 5.73 | 692 | 5.70 | 202 | 5.72 | 3,698 |
| | <u>Region 6</u> | <u>No.*</u> | <u>Region 7</u> | <u>No.*</u> | <u>Region 8</u> | <u>No.*</u> | <u>Region 9</u> | <u>No.*</u> | <u>Region 10</u> | <u>No.*</u> |
| | -% - | | -% - | | -% - | | -% - | | -% - | |
| January | 5.69 | 18 | 5.68 | 19 | 5.69 | 301 | 5.67 | 381 | N/A | N/A |
| February | 5.69 | 19 | 5.69 | 19 | 5.70 | 321 | 5.68 | 378 | N/A | N/A |
| March | 5.70 | 19 | 5.70 | 19 | 5.71 | 355 | 5.68 | 377 | N/A | N/A |
| April | 5.73 | 19 | 5.71 | 19 | 5.72 | 358 | 5.69 | 398 | N/A | N/A |
| May | 5.78 | 19 | 5.72 | 18 | 5.72 | 363 | 5.71 | 398 | N/A | N/A |
| June | 5.75 | 19 | 5.76 | 18 | 5.72 | 362 | 5.74 | 392 | N/A | N/A |
| July | 5.74 | 19 | 5.74 | 17 | 5.68 | 372 | 5.69 | 385 | N/A | N/A |
| August | 5.73 | 19 | 5.76 | 17 | 5.56 | 373 | 5.70 | 396 | N/A | N/A |
| September | 5.70 | 19 | 5.77 | 17 | 5.69 | 494 | 5.72 | 538 | N/A | N/A |
| October | 5.71 | 19 | 5.71 | 17 | 5.73 | 467 | 5.71 | 502 | N/A | N/A |
| November | 5.70 | 19 | 5.70 | 20 | 5.74 | 511 | 5.71 | 509 | N/A | N/A |
| December | 5.73 | 19 | 5.71 | 20 | 5.72 | 510 | 5.70 | 486 | N/A | N/A |
| For the Year | 5.72 | 227 | 5.72 | 220 | 5.70 | 4,787 | 5.70 | 5,140 | 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
2000**

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

Pacific Northwest Order

| | <u>c</u> | <u>b</u> | <u>Standard</u> | <u>R-Squared</u> | <u>Standard</u> | <u>Number of</u> |
|--------------|-----------------|--------------------|-------------------|-------------------|-----------------|--------------------|
| | <u>Constant</u> | <u>Butterfat</u> | <u>Error of b</u> | <u>(Adjusted)</u> | <u>Error</u> | <u>Comparisons</u> |
| | | <u>Coefficient</u> | | | | |
| January | 1.51613 | 0.41196 | 0.00979 | 0.62292 | 0.12469 | 1,073 |
| February | 1.50062 | 0.40891 | 0.01026 | 0.59680 | 0.12464 | 1,073 |
| March | 1.53878 | 0.40269 | 0.01016 | 0.59611 | 0.12220 | 1,064 |
| April | 1.50824 | 0.41520 | 0.01065 | 0.58663 | 0.12362 | 1,071 |
| May | 1.43037 | 0.43501 | 0.01151 | 0.62720 | 0.12538 | 850 |
| June | 1.45996 | 0.42541 | 0.01089 | 0.64307 | 0.11545 | 848 |
| July | 1.47172 | 0.41674 | 0.00997 | 0.62717 | 0.10527 | 1,039 |
| August | 1.53720 | 0.40791 | 0.00998 | 0.61599 | 0.10779 | 1,041 |
| September | 1.65025 | 0.38672 | 0.00909 | 0.58282 | 0.11339 | 1,297 |
| October | 1.66668 | 0.39041 | 0.00954 | 0.57224 | 0.12378 | 1,252 |
| November | 1.66242 | 0.39232 | 0.00954 | 0.59634 | 0.12544 | 1,144 |
| December | 1.59501 | 0.40377 | 0.01108 | 0.54259 | 0.13610 | 1,120 |
| For the Year | 1.52581 | 0.41362 | 0.00298 | 0.59957 | 0.12565 | 12,872 |

Western Order

| | <u>c</u> | <u>b</u> | <u>Standard</u> | <u>R-Squared</u> | <u>Standard</u> | <u>Number of</u> |
|--------------|-----------------|--------------------|-------------------|-------------------|-----------------|--------------------|
| | <u>Constant</u> | <u>Butterfat</u> | <u>Error of b</u> | <u>(Adjusted)</u> | <u>Error</u> | <u>Comparisons</u> |
| | | <u>Coefficient</u> | | | | |
| January | 1.66121 | 0.38976 | 0.01461 | 0.50372 | 0.11770 | 701 |
| February | 1.67767 | 0.37876 | 0.01474 | 0.47919 | 0.11575 | 718 |
| March | 1.76285 | 0.35912 | 0.01460 | 0.44614 | 0.11137 | 751 |
| April | 1.89307 | 0.31960 | 0.01556 | 0.35225 | 0.11306 | 775 |
| May | 1.92684 | 0.30874 | 0.01640 | 0.31524 | 0.11688 | 769 |
| June | 1.81603 | 0.33644 | 0.01643 | 0.35534 | 0.11133 | 760 |
| July | 1.91409 | 0.30948 | 0.01748 | 0.29260 | 0.11859 | 756 |
| August | 2.03920 | 0.27435 | 0.01606 | 0.27545 | 0.11881 | 766 |
| September | 2.13059 | 0.26647 | 0.01558 | 0.27654 | 0.12481 | 764 |
| October | 1.97335 | 0.31860 | 0.01424 | 0.39982 | 0.11853 | 751 |
| November | 1.97166 | 0.32553 | 0.01474 | 0.38319 | 0.13421 | 784 |
| December | 1.96855 | 0.31915 | 0.01507 | 0.36974 | 0.13788 | 764 |
| For the Year | 1.74565 | 0.36645 | 0.00428 | 0.44677 | 0.12595 | 9,059 |

TABLE A-6

MONTHLY PRODUCER COMPONENT PRICES
2000

| Month | Pacific Northwest and Western Order | | | Pacific Northwest Order | Western Order |
|----------------|--|------------------|-----------------------|--------------------------------|--------------------------------|
| | Butterfat Price | Protein Price | Other Solids Price | Producer Price Differential | Producer Price Differential |
| | \$/ pound | \$/ pound | \$/ pound | \$/ hundredweight | \$/ hundredweight |
| January | 0.9366 | 2.1677 | 0.0503 | 1.06 | 1.06 |
| February | 0.9588 | 1.9849 | 0.0432 | 1.52 | 1.39 |
| March | 1.0191 | 1.9166 | 0.0424 | 1.63 | 1.48 |
| April | 1.1352 | 1.7399 | 0.0408 | 1.90 | 1.35 |
| May | 1.2854 | 1.5514 | 0.0403 | 2.33 | 1.47 |
| June | 1.4128 | 1.4278 | 0.0438 | 2.45 | 1.55 |
| July | 1.2691 | 1.9726 | 0.0557 | 1.53 | 1.07 |
| August | 1.2659 | 1.7952 | 0.0577 | 1.81 | 1.40 |
| September | 1.2707 | 2.0137 | 0.0502 | 1.35 | 1.18 |
| October | 1.2444 | 1.8028 | 0.0471 | 1.77 | 1.47 |
| November | 1.5745 | 0.9149 | 0.0565 | 3.23 | 2.11 |
| December | 1.6534 | 1.0378 | 0.0829 | 2.90 | 1.83 |
| Simple Average | 1.2522 | 1.6938 | 0.0509 | 1.96 | 1.45 |

Arizona-Las Vegas Order

| Month | Skim Price \$/ hundredweight | Butterfat Price \$/ pound |
|----------------|------------------------------------|---------------------------------|
| January | 8.22 | 0.95 |
| February | 8.02 | 0.96 |
| March | 8.00 | 1.02 |
| April | 7.79 | 1.12 |
| May | 7.61 | 1.27 |
| June | 7.51 | 1.39 |
| July | 8.05 | 1.30 |
| August | 8.01 | 1.28 |
| September | 8.15 | 1.27 |
| October | 7.88 | 1.25 |
| November | 6.78 | 1.51 |
| December | 7.05 | 1.60 |
| Simple Average | 7.76 | 1.24 |

TABLE A-7

**AGGREGATED COMPONENT VALUES BY SIZE RANGE
PRODUCER MILK DELIVERIES
2000**

Pacific Northwest Order

| <u>Size Range</u> | | <u>Aggregated Component Values*</u> - dollars - | <u>Producer Milk</u> - pounds - | <u>Percent of Producer Milk</u> - % - | <u>Weighted Average Value</u> - dollars/cwt. - |
|--|------------------------------------|--|--|--|---|
| <u>Equal to or more than</u> - pounds - | <u>Less than</u> - pounds - | | | | |
| | 50,000 | 4,292,015.95 | 33,616,930 | 0.50% | 12.77 |
| 50,000 | 100,000 | 12,058,555.66 | 96,098,598 | 1.42% | 12.55 |
| 100,000 | 200,000 | 51,687,683.01 | 420,057,887 | 6.20% | 12.30 |
| 200,000 | 300,000 | 52,790,095.00 | 431,610,137 | 6.37% | 12.23 |
| 300,000 | 400,000 | 47,787,519.61 | 393,977,182 | 5.81% | 12.13 |
| 400,000 | 500,000 | 40,013,743.83 | 331,951,647 | 4.90% | 12.05 |
| 500,000 | 600,000 | 43,616,712.82 | 362,915,731 | 5.36% | 12.02 |
| 600,000 | 700,000 | 43,000,492.34 | 360,926,350 | 5.33% | 11.91 |
| 700,000 | 1,000,000 | 97,463,113.22 | 814,700,608 | 12.02% | 11.96 |
| 1,000,000 | 3,000,000 | 304,516,530.56 | 2,579,852,202 | 38.08% | 11.80 |
| 3,000,000 | | 110,707,642.11 | 949,903,841 | 14.02% | 11.65 |
| Total/Weighted Average | | 807,934,104.11 | 6,775,611,113 | 100.00% | 11.92 |

Western Order

| <u>Size Range</u> | | <u>Aggregated Component Values*</u> - dollars - | <u>Producer Milk</u> - pounds - | <u>Percent of Producer Milk</u> - % - | <u>Weighted Average Value</u> - dollars/cwt. - |
|--|------------------------------------|--|--|--|---|
| <u>Equal to or more than</u> - pounds - | <u>Less than</u> - pounds - | | | | |
| | 50,000 | 3,487,954.43 | 29,340,666 | 0.73% | 11.89 |
| 50,000 | 100,000 | 12,927,016.91 | 109,653,052 | 2.71% | 11.79 |
| 100,000 | 200,000 | 37,589,511.34 | 324,096,681 | 8.02% | 11.60 |
| 200,000 | 300,000 | 30,597,926.10 | 266,807,740 | 6.60% | 11.47 |
| 300,000 | 400,000 | 23,847,704.42 | 209,775,494 | 5.19% | 11.37 |
| 400,000 | 500,000 | 19,992,104.24 | 174,240,791 | 4.31% | 11.47 |
| 500,000 | 600,000 | 18,824,146.67 | 164,146,815 | 4.06% | 11.47 |
| 600,000 | 700,000 | 18,246,642.14 | 160,818,871 | 3.98% | 11.35 |
| 700,000 | 1,000,000 | 46,253,203.66 | 407,329,357 | 10.08% | 11.36 |
| 1,000,000 | 3,000,000 | 159,355,107.78 | 1,404,569,942 | 34.76% | 11.35 |
| 3,000,000 | | 89,338,588.75 | 789,895,536 | 19.55% | 11.31 |
| Total/Weighted Average | | 460,459,906.44 | 4,040,674,945 | 100.00% | 11.40 |

TABLE A-7 (Continued)

**AGGREGATED COMPONENT VALUES BY SIZE RANGE
PRODUCER MILK DELIVERIES
2000**

Arizona-Las Vegas Order

| <u>Size Range</u> | | <u>Aggregated Component Values*</u> | <u>Producer Milk</u> | <u>Percent of Producer Milk</u> | <u>Weighted Average Value</u> |
|----------------------------------|----------------------|---|--------------------------|---|---------------------------------------|
| <u>Equal to or more than</u> | <u>Less than</u> | | | | |
| - pounds - | - pounds - | - dollars - | - pounds - | - % - | - dollars/cwt. - |
| | 50,000 | 69,068.59 | 570,810 | 0.02% | 12.10 |
| 50,000 | 100,000 | 118,095.53 | 972,031 | 0.03% | 12.15 |
| 100,000 | 200,000 | 329,347.19 | 2,755,499 | 0.09% | 11.95 |
| 200,000 | 300,000 | 390,587.04 | 3,201,846 | 0.10% | 12.20 |
| 300,000 | 400,000 | 1,284,283.84 | 10,684,212 | 0.34% | 12.02 |
| 400,000 | 500,000 | 2,494,870.79 | 20,702,973 | 0.67% | 12.05 |
| 500,000 | 600,000 | 4,270,044.37 | 35,250,720 | 1.14% | 12.11 |
| 600,000 | 700,000 | 5,417,940.27 | 45,171,873 | 1.45% | 11.99 |
| 700,000 | 1,000,000 | 19,432,376.62 | 161,048,063 | 5.19% | 12.07 |
| 1,000,000 | 2,000,000 | 78,872,655.00 | 650,903,657 | 20.96% | 12.12 |
| 2,000,000 | 3,000,000 | 78,093,555.41 | 652,771,029 | 21.02% | 11.96 |
| 3,000,000 | 4,000,000 | 43,997,371.09 | 372,212,802 | 11.98% | 11.82 |
| 4,000,000 | 5,000,000 | 24,545,327.42 | 204,633,282 | 6.59% | 11.99 |
| 5,000,000 | 6,000,000 | 31,502,323.93 | 263,739,313 | 8.49% | 11.94 |
| 6,000,000 | 7,000,000 | 23,668,617.96 | 199,120,774 | 6.41% | 11.89 |
| 7,000,000 | | 56,849,069.91 | 481,941,755 | 15.52% | 11.80 |
| Total/Weighted Average | | 371,335,534.96 | 3,105,680,639 | 100.00% | 11.96 |

* Based on Federal order minimum prices.

Figure A-1
PACIFIC NORTHWEST ORDER
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE BUTTERFAT
LEVELS: 2000

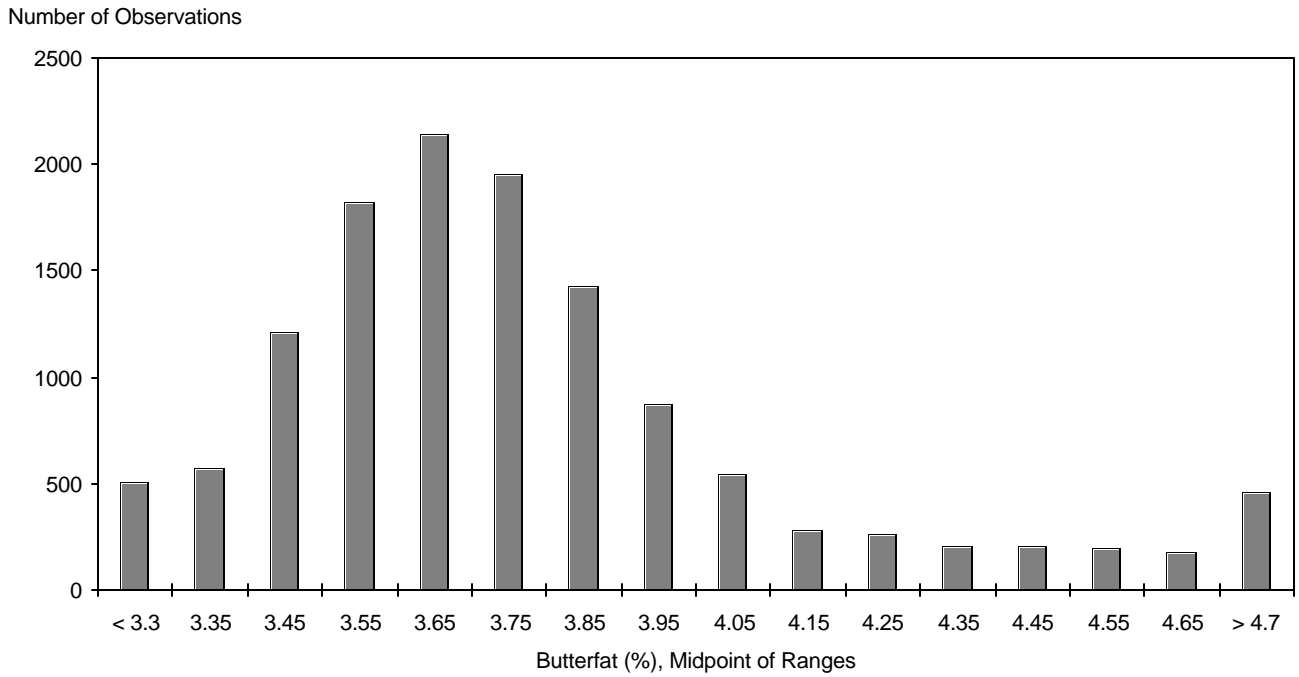
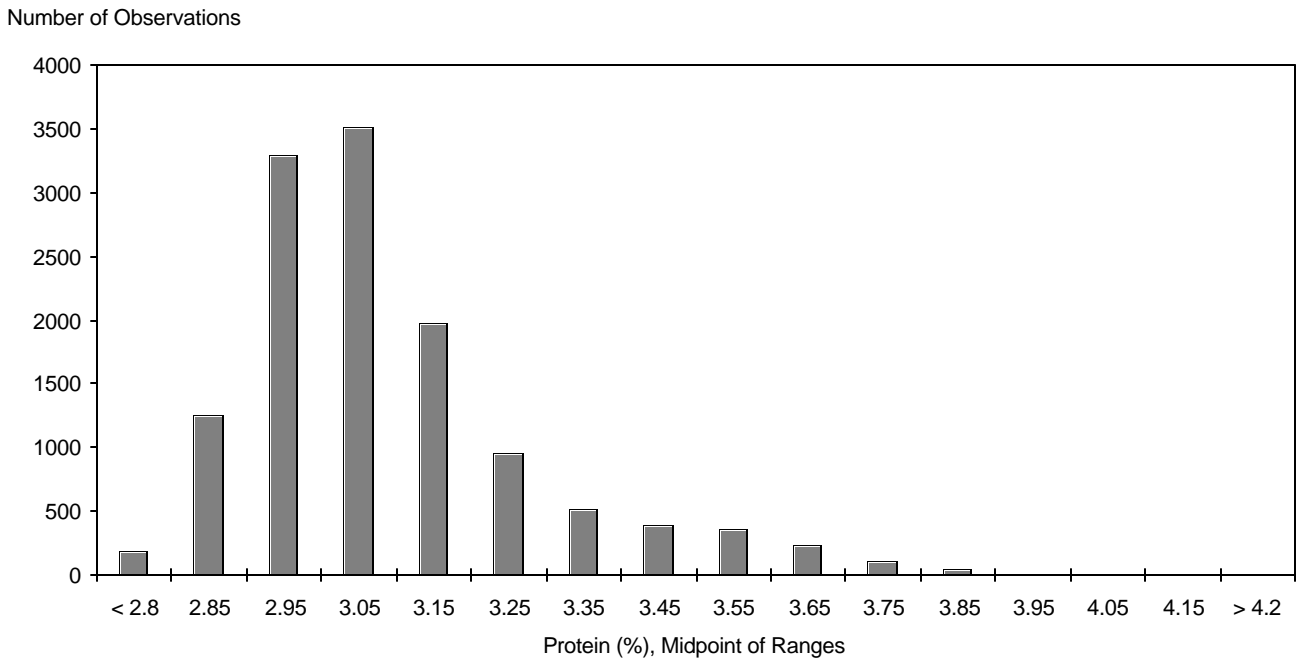
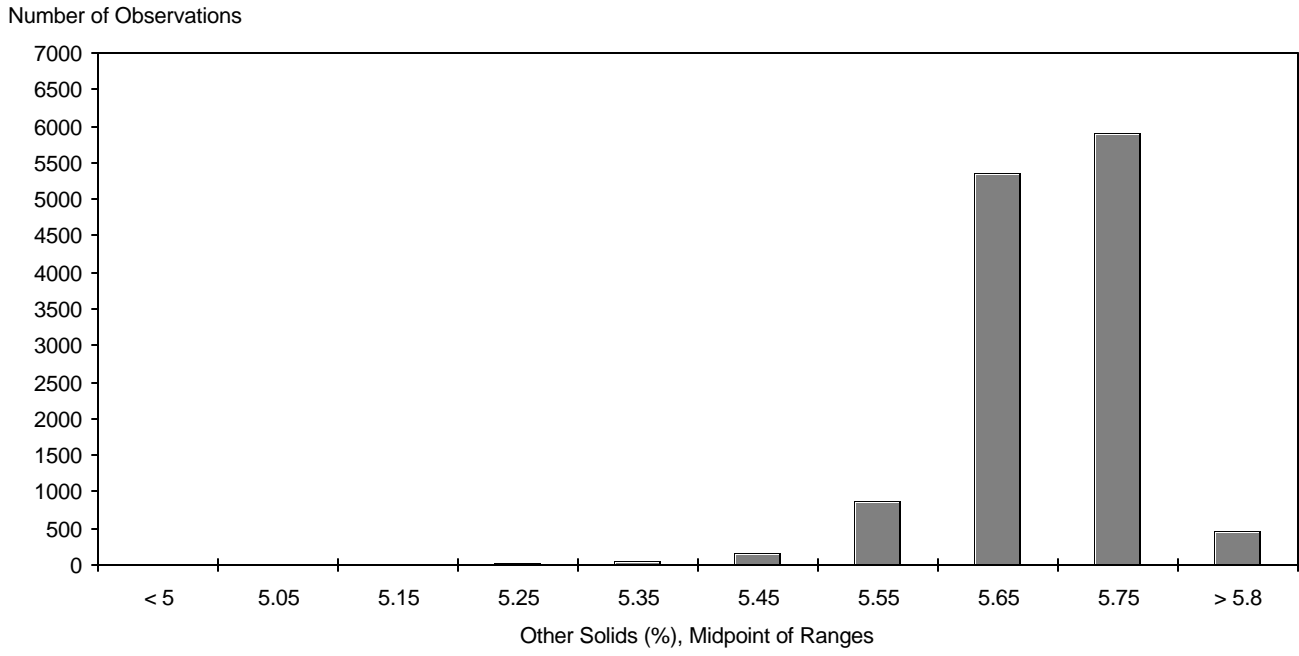


Figure A-2
PACIFIC NORTHWEST ORDER
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE PROTEIN
LEVELS: 2000



**Figure A-3
PACIFIC NORTHWEST ORDER
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE OTHER SOLIDS
LEVELS: 2000**



**Figure A-4
WESTERN ORDER
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE BUTTERFAT
LEVELS: 2000**

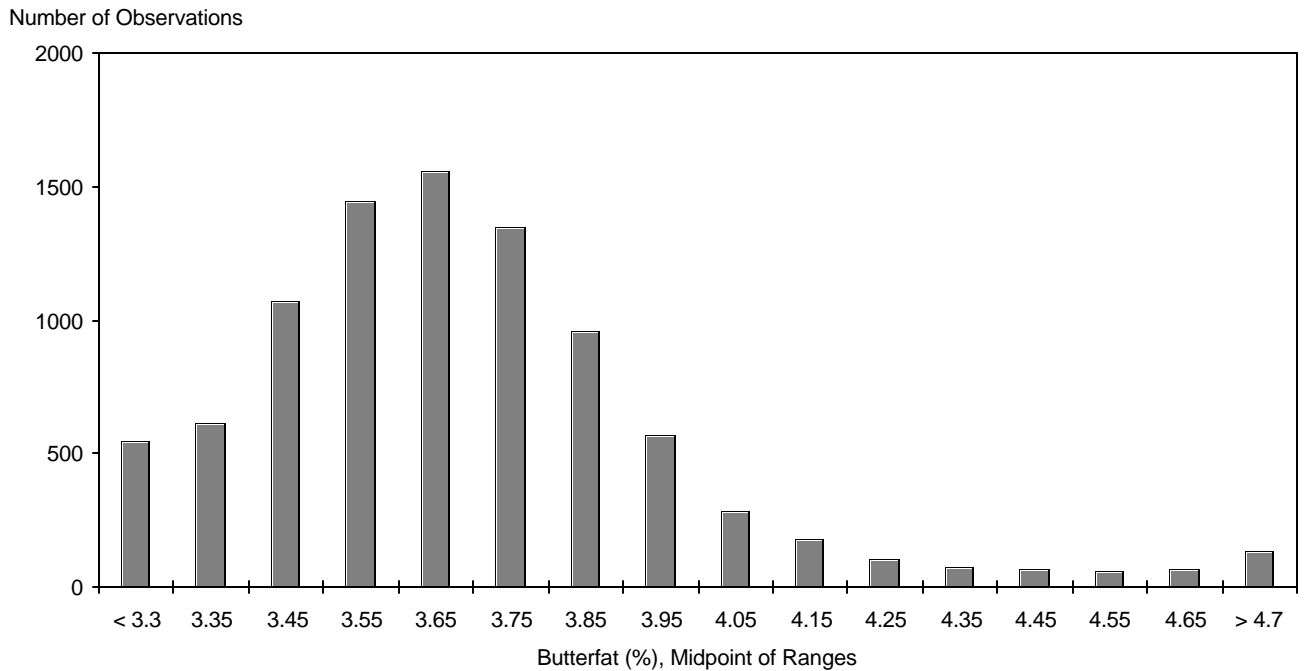


Figure A-5
WESTERN ORDER
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE PROTEIN
LEVELS: 2000

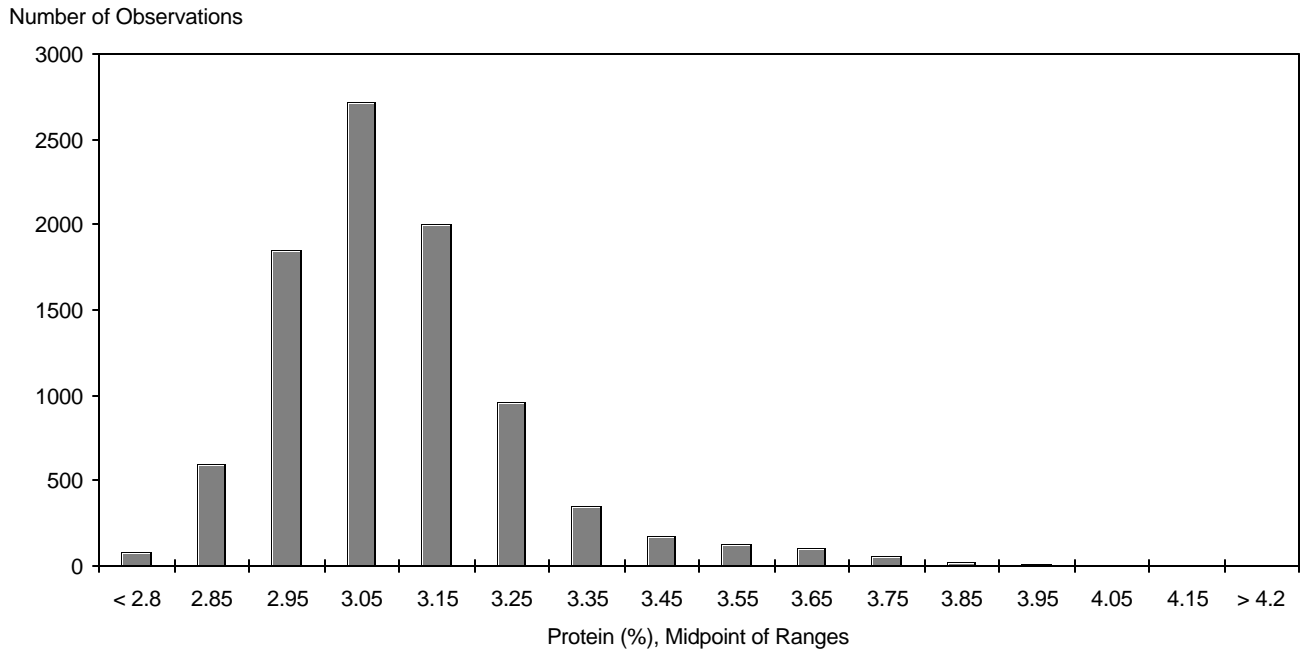


Figure A-6
WESTERN ORDER
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE OTHER SOLIDS
LEVELS: 2000

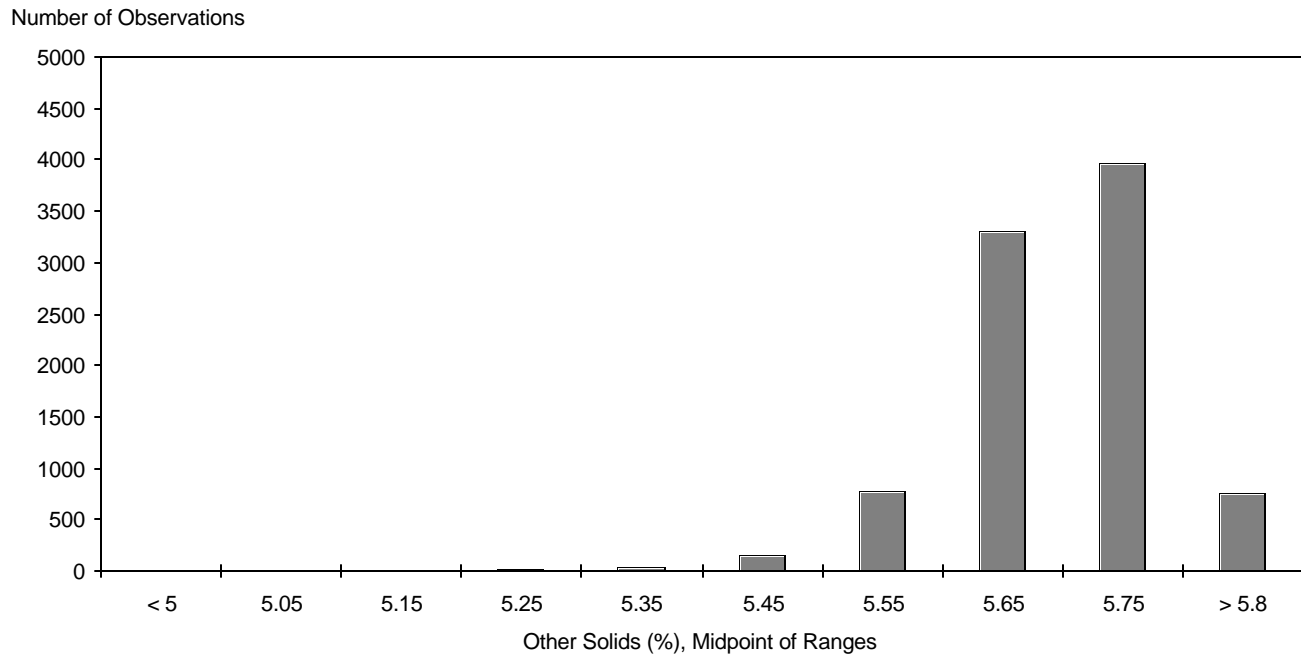


Figure A-7
ARIZONA LAS VEGAS ORDER
FREQUENCY DISTRIBUTION OF MONTHLY AVERAGE BUTTERFAT
LEVELS: 2000

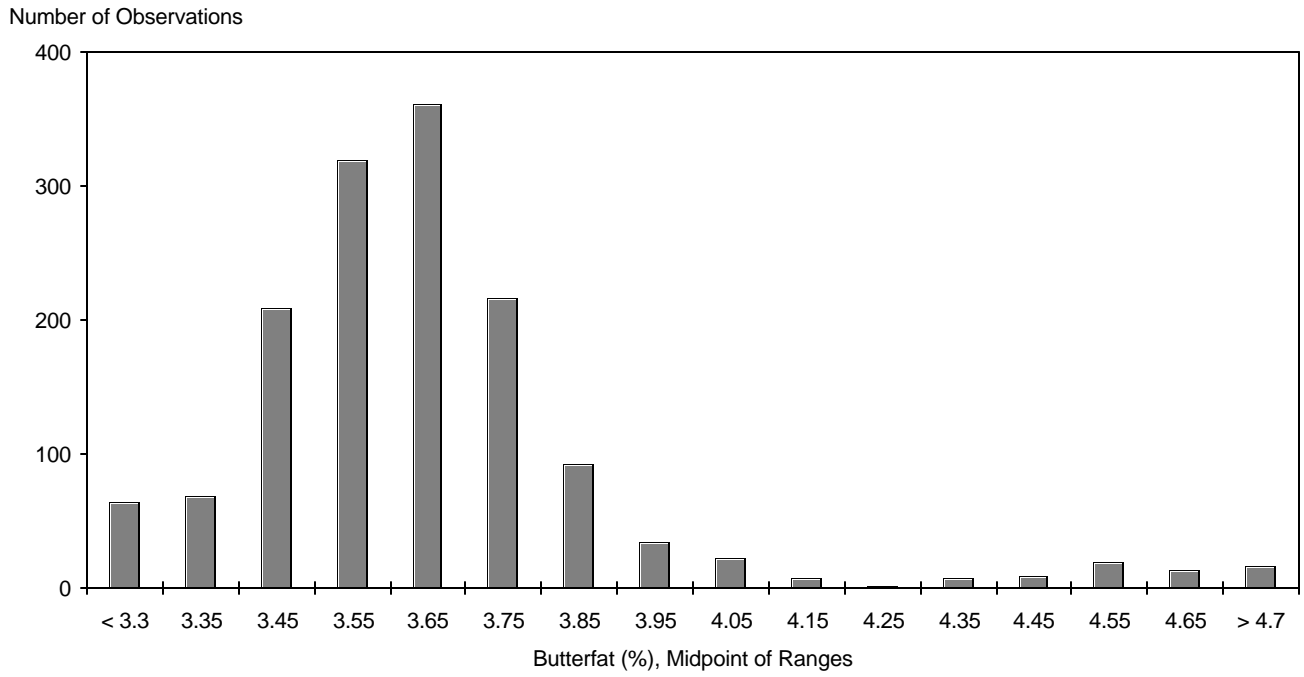


Figure A-8
SCATTER PLOT OF PROTEIN AND BUTTERFAT
MAY AND NOVEMBER 2000
Pacific Northwest Order

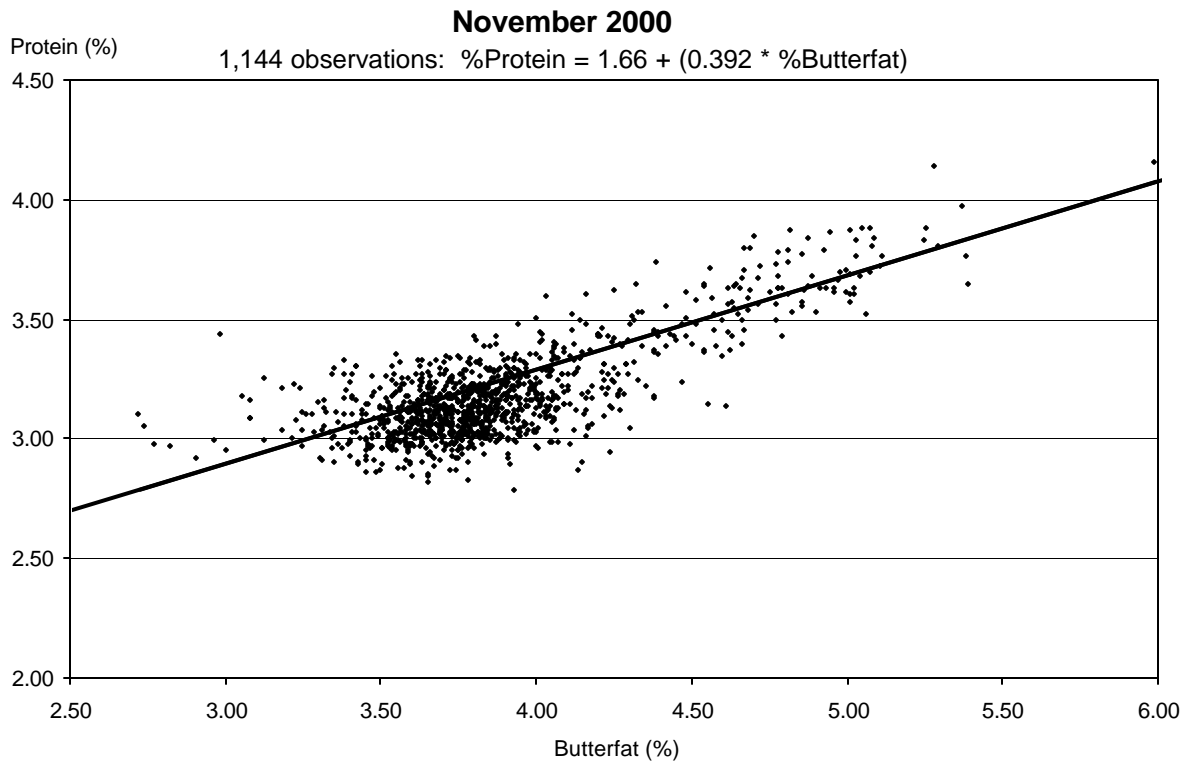
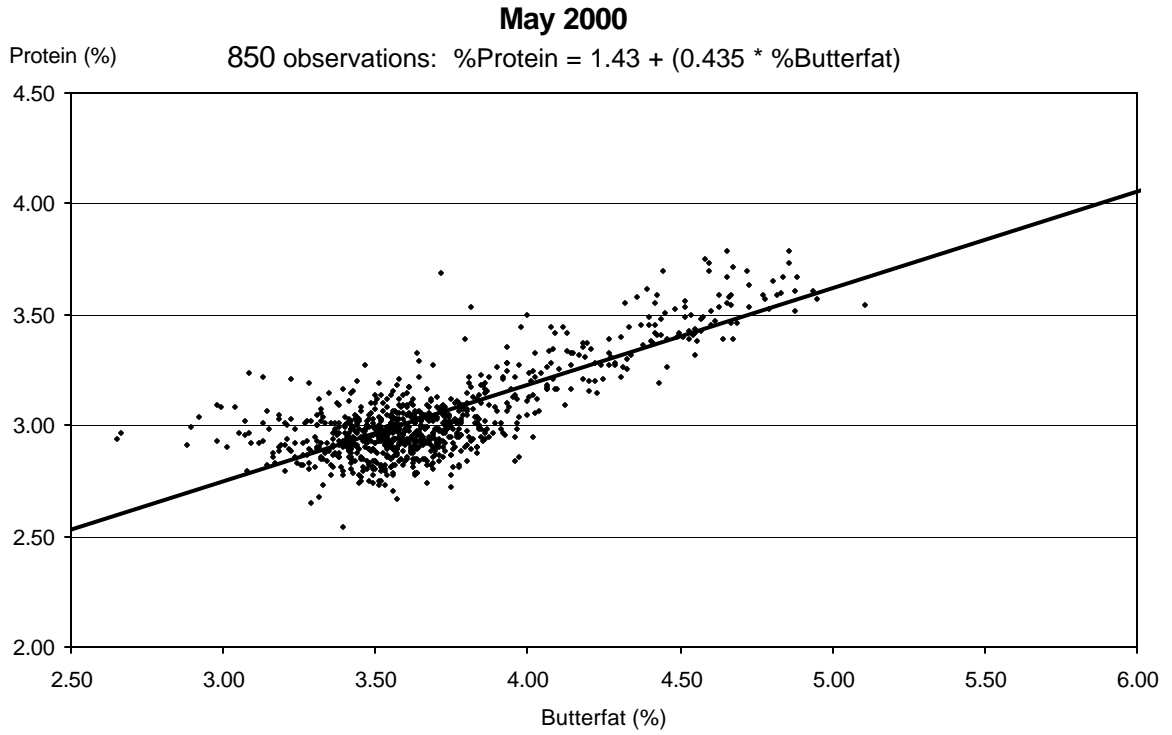


Figure A-9
SCATTER PLOT OF PROTEIN AND BUTTERFAT
MAY AND NOVEMBER 2000
Western Order

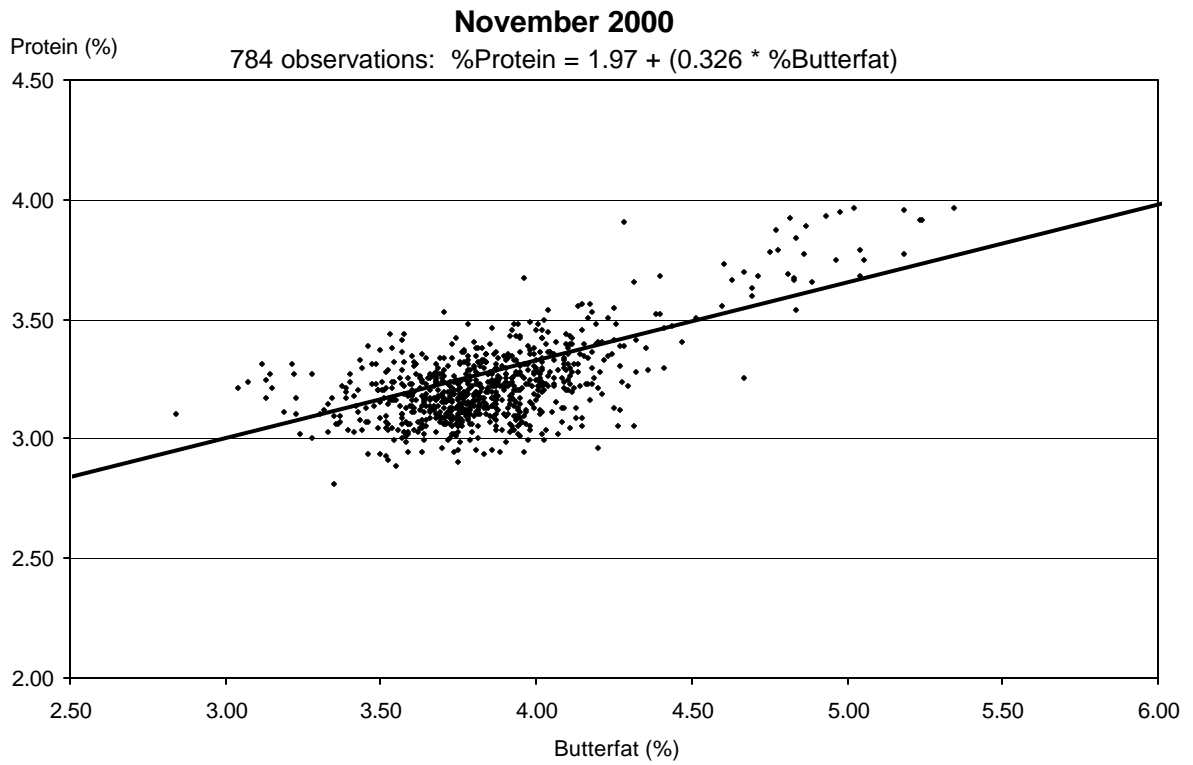
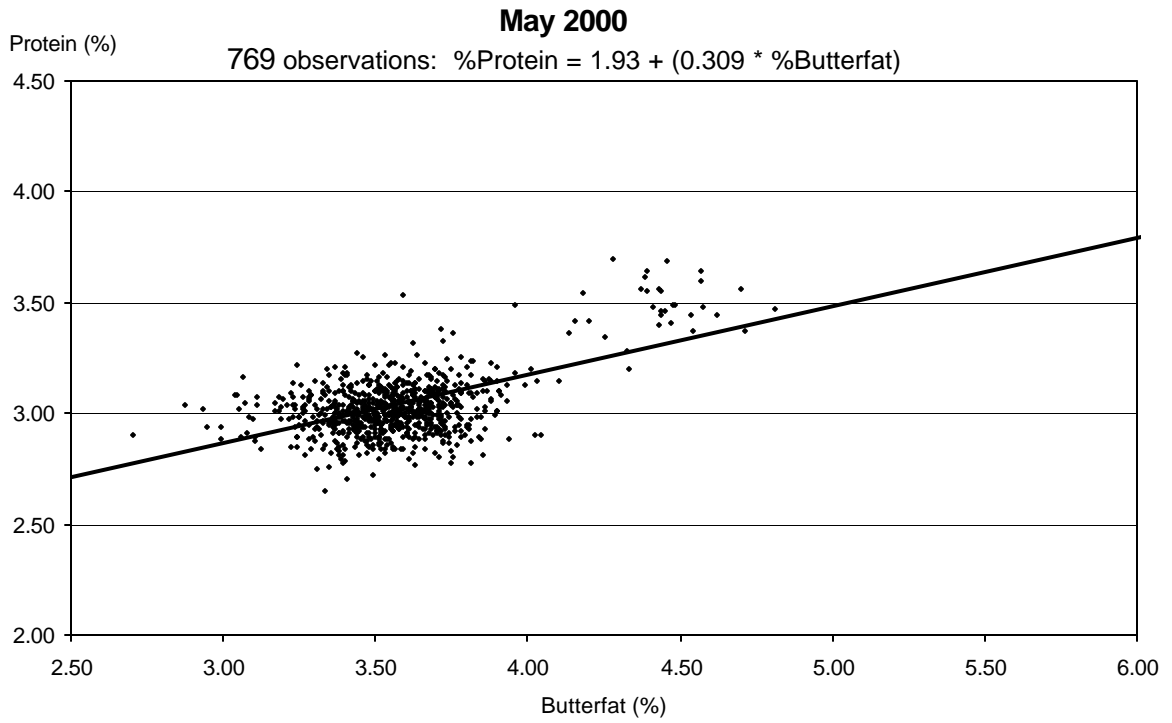


Figure A-10
SCATTER PLOT OF OTHER SOLIDS AND BUTTERFAT
MAY AND NOVEMBER 2000
Pacific Northwest Order

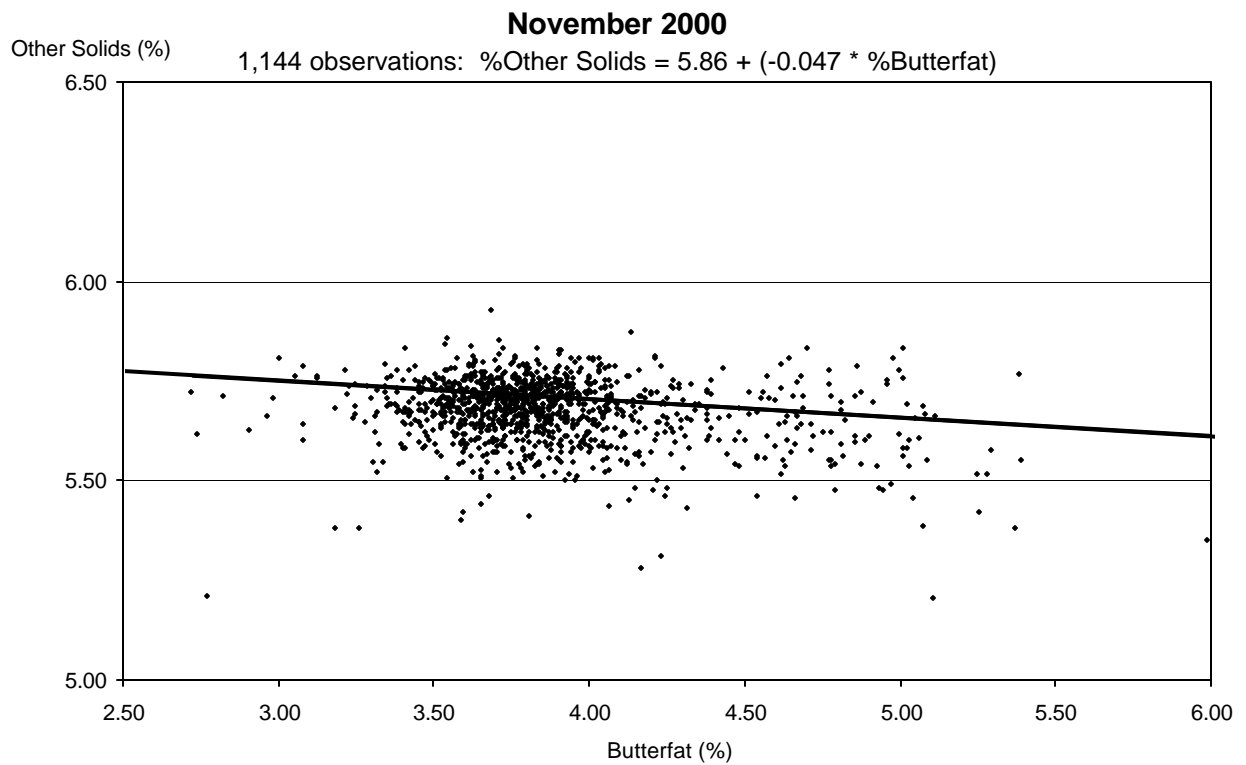
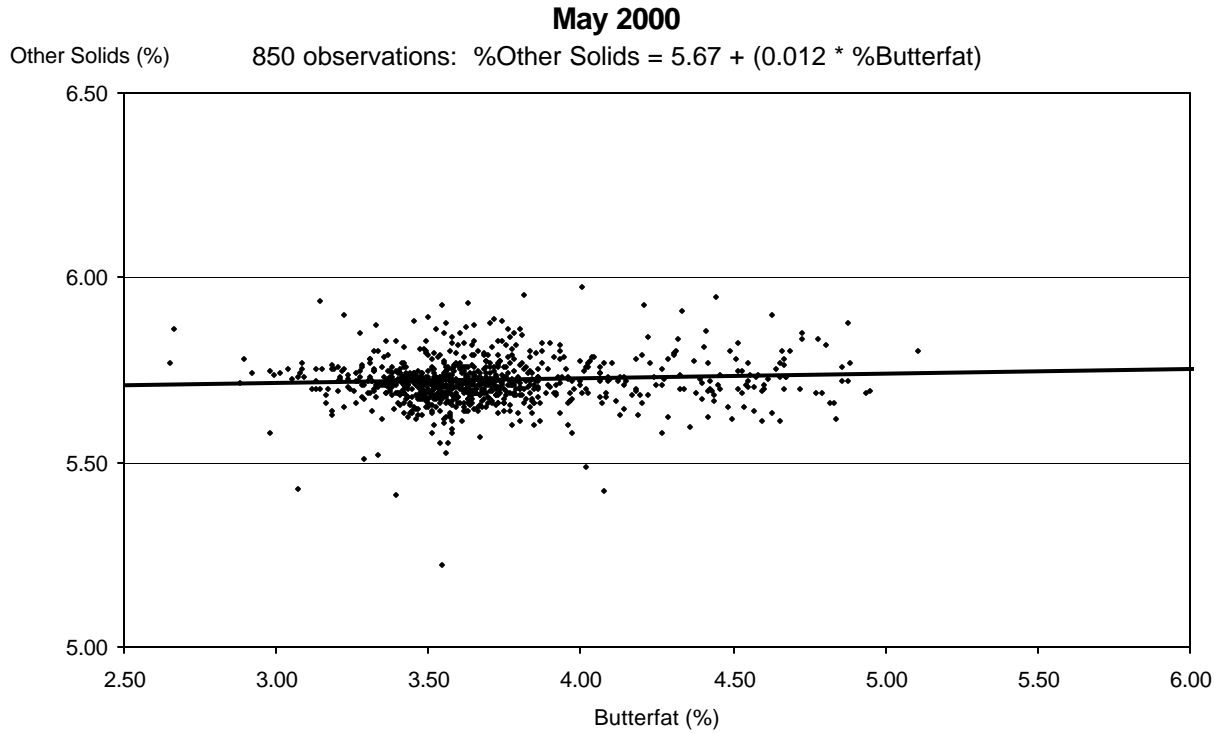
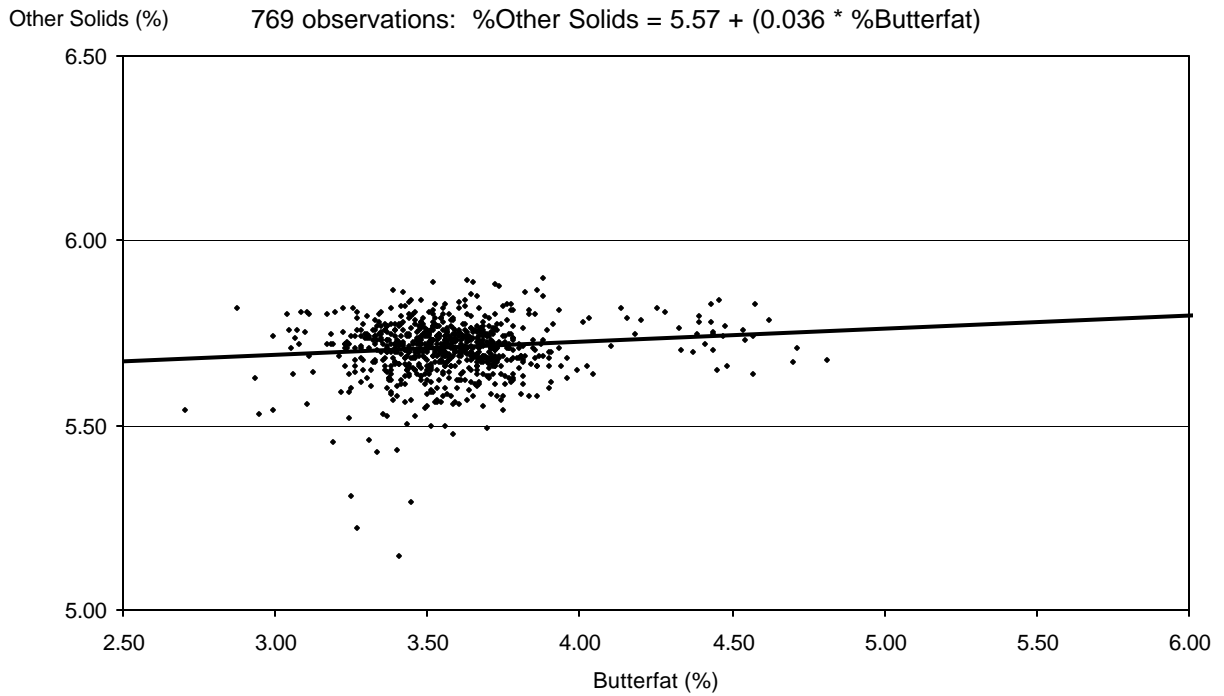


Figure A-11
SCATTER PLOT OF OTHER SOLIDS AND BUTTERFAT
MAY AND NOVEMBER 2000
Western Order

May 2000



November 2000

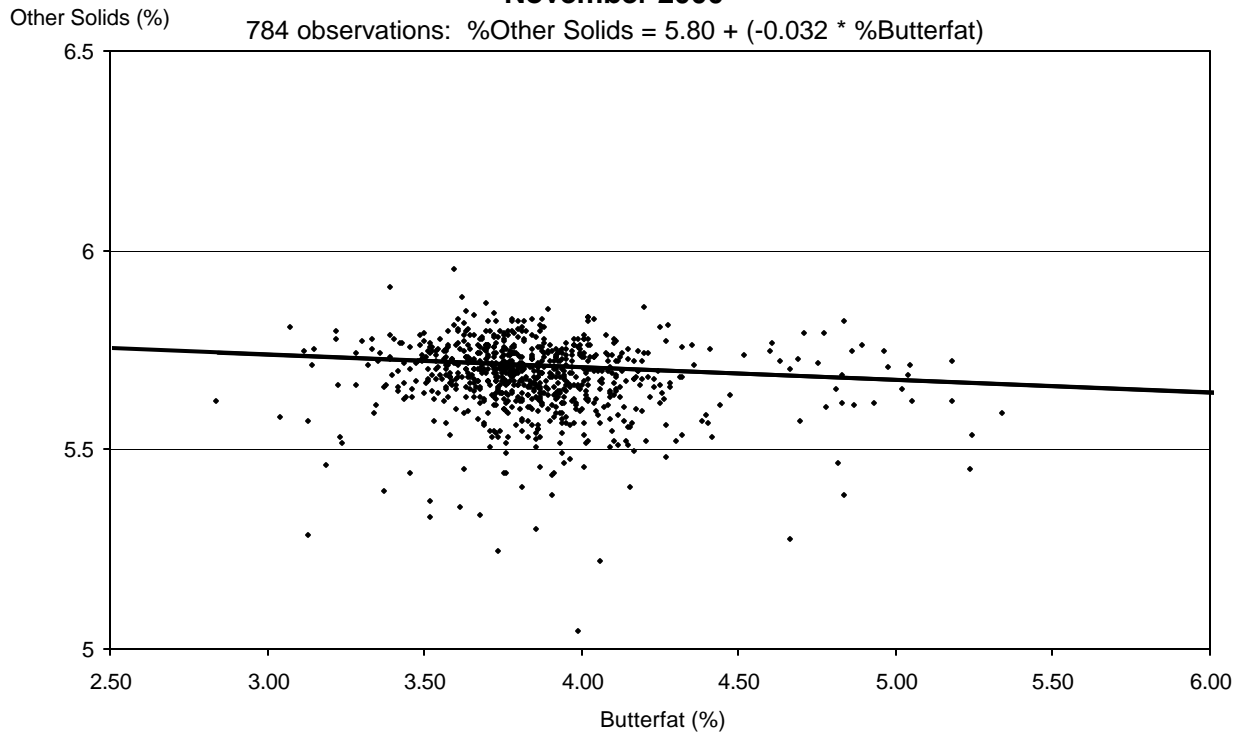
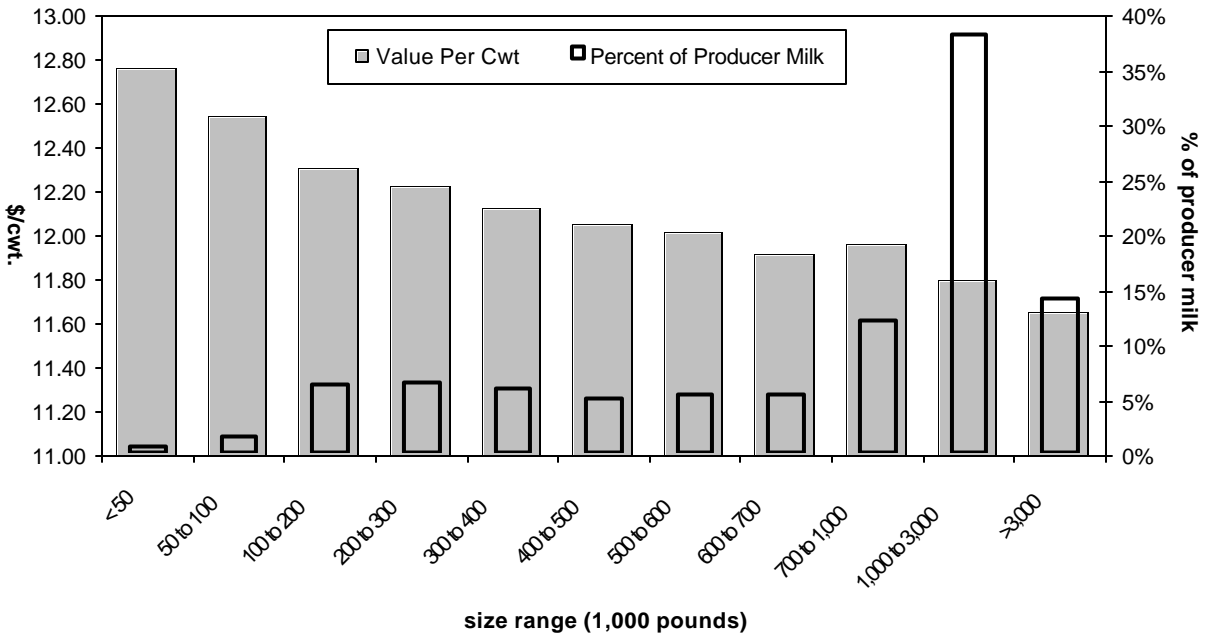


Figure A-12
WEIGHTED AVERAGE VALUES AND PERCENT OF PRODUCER MILK
BY SIZE RANGE OF PRODUCER MILK DELIVERIES
2000

Pacific Northwest Order



Western Order

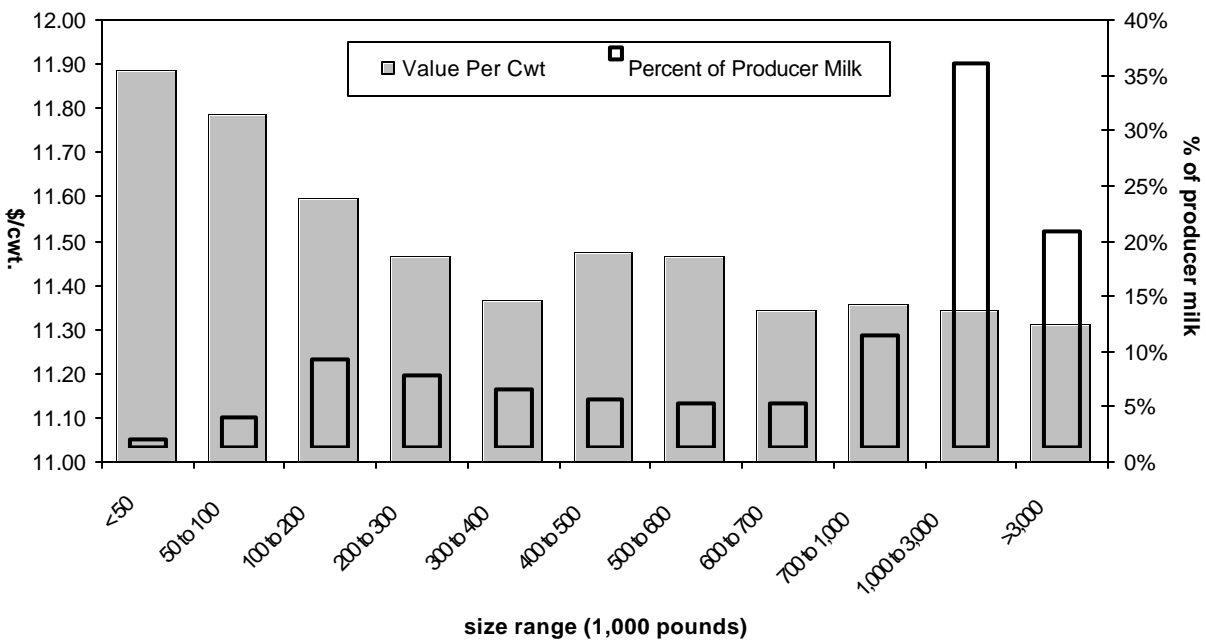
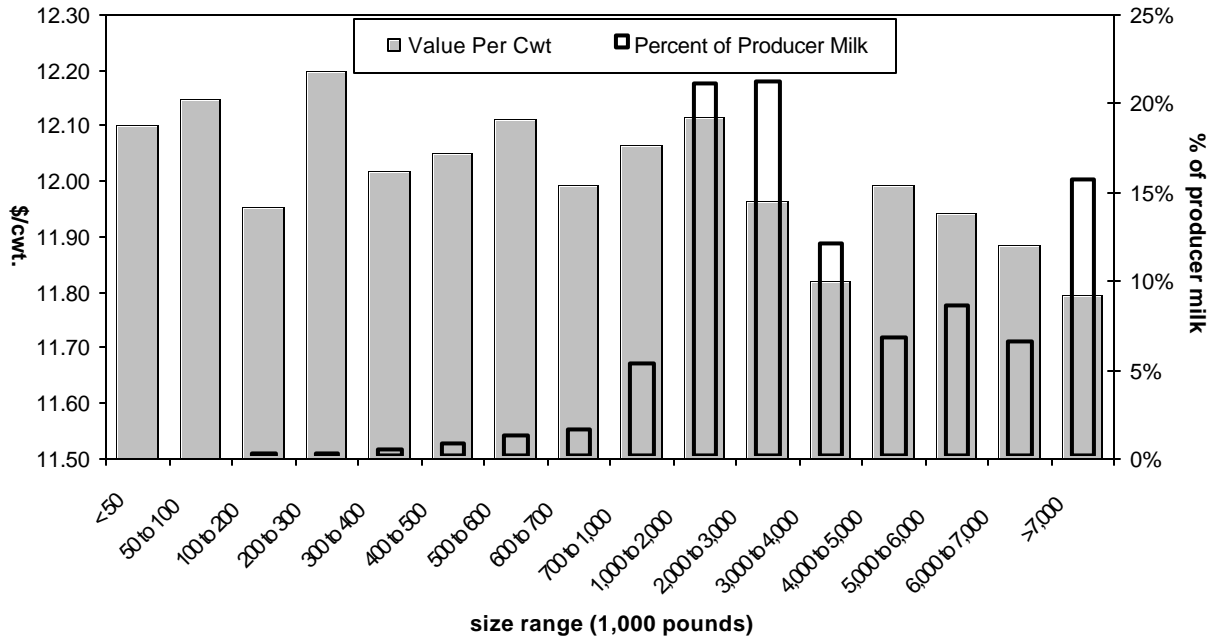


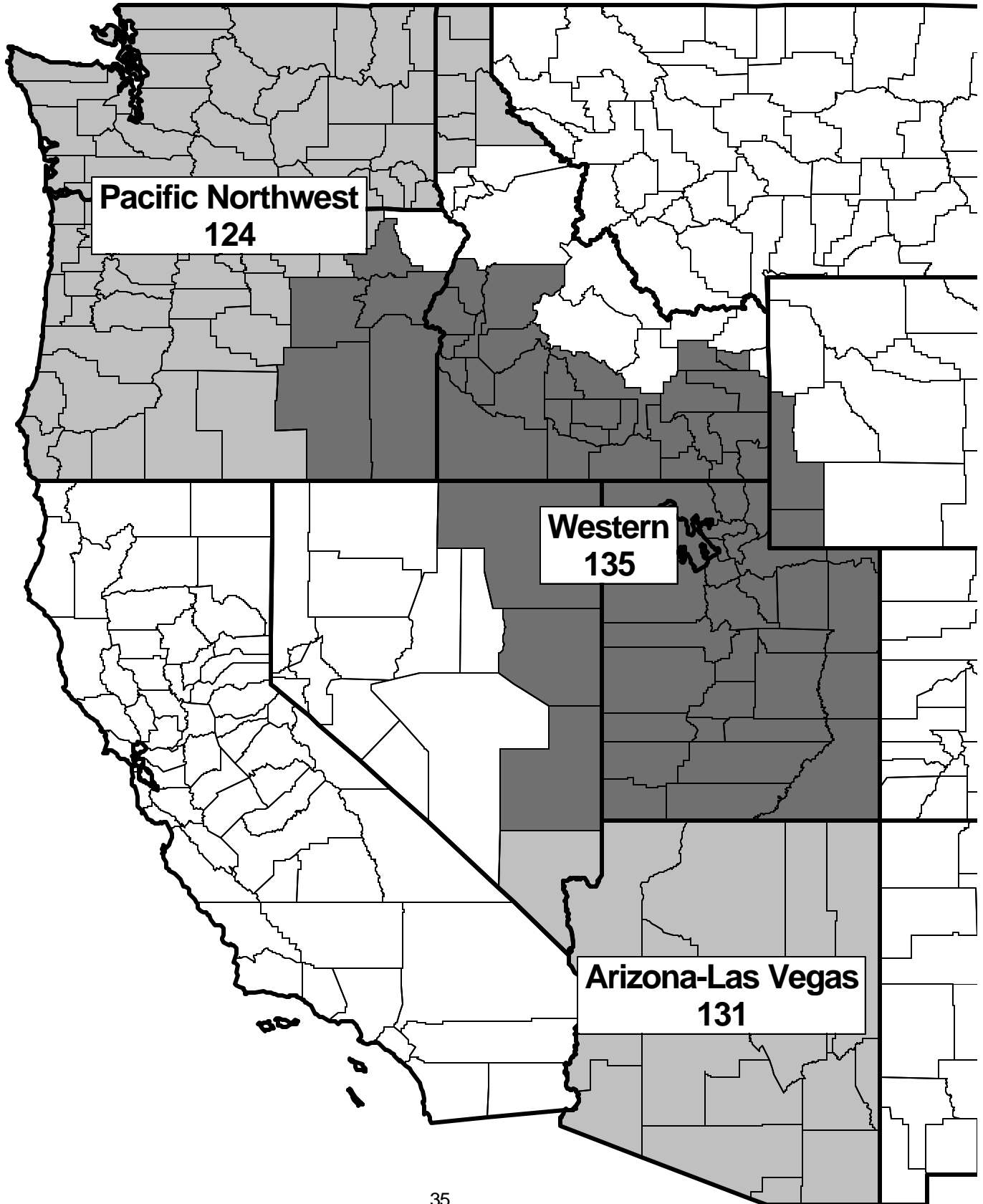
Figure A-12 (continued)
WEIGHTED AVERAGE VALUES AND PERCENT OF PRODUCER MILK
BY SIZE RANGE OF PRODUCER MILK DELIVERIES
2000

Arizona-Las Vegas Order



MAP A-1

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



Map A-2

Regions of the Pacific Northwest, Arizona-Las Vegas, and Western Orders

