Exhibit 49

Calculating Component Values from the Modified Van Slyke Cheese Yield Formula

The Van Slyke Cheddar cheese yield formula can simplified into yield factors for butterfat and protein. Casein loss during cheesemaking can be included in these yield factors in different ways.

Determining the Cheese Yield per Pound Milk Crude Protein when Casein loss is a Fixed Value Independent of Protein Concentration

In its most common form, the Van Slyke Cheese Yield Formula has the following form:

$$\textbf{Cheddar Yield PER CWT: } = \frac{\{(\text{Cheese Fat Pounds} \times 0.90) + (\text{Protein Pounds} \times 0.78 - 0.1)\} \times 1.09}{1 - (38\% \text{ Moisture in Cheese})}$$

The formula's structure allows it to be divided into several parts. The fat and protein portions of the equation can be separated as follows:

$$\textbf{Cheddar Yield} = \frac{(\text{Cheese Fat Pounds} \times 0.90) \times 1.09}{0.62} + \frac{(\text{Protein Pounds} \times 0.78 - 0.1) \times 1.09}{0.62}$$

The Protein portion of the formula can be further divided to two parts, leaving the following equation:

$$\textbf{Cheddar Yield} = \frac{(\text{Cheese Fat Pounds} \times 0.90) \times 1.09}{0.62} + \frac{(\text{Protein Pounds} \times 0.78) \times 1.09}{0.62} + \frac{(-0.1) \times 1.09}{0.62}$$

Each of the three parts of the equation are multiplied by 1.09 and divided by (1 - 0.38) or 0.62.
1.09 / 0.62 equals 1.758065, leaving the following Equation:

Cheddar Yield = (Cheese Fat # x 0.90) x 1.758065 + (Protein Pounds x 0.78) x 1.758065 + (-0.1 x 1.758065)

This Cheddar yield equation can then be further reduced to a factor for fat, a factor for protein, and for casein loss.

Cheddar Yield per Cwt. = (Cheese Fat Pounds x 1.582259) + (Protein Pounds x 1.371291) - 0.175807

Thus, the equation for cheese yield per cwt. is reduced to a factor for fat per pound, a factor for protein per pound and factor for casein loss per cwt. Table 1 below summarizes the yield factors determined from this method:

Table 1. Milk Component Yield Factors Using the Van Slyke Cheddar Yield Formula
Casein Loss Assumed as Constant 0.1 Pound per Cwt. Milk:

Butterfat Factor for Cheese Yield:	1.582259	per lb. butterfat	Rounded: 1.5823
Protein Factor for Cheese Yield:	1.371291	per pound protein	Rounded: 1.3713
Casein Loss per Cwt. Milk:	-0.175807	per cwt. milk	Rounded: -0.1758

When cheese yield components are valued in this way, the protein factor and the constant for casein loss may raise questions. Why is the protein recovery factor determined from this method higher than the one usually assigned to cheese yield (1.32)? Also, why is there a casein loss factor of -0.175807 per cwt. milk?

The answers lie in the constant casein loss factor (- 0.1) included in the Van Slyke Cheese Yield Formula. In this form, the Van Slyke formula assumes the casein loss to be the same, regardless of protein test. The cheese yield lost from losing 0.1 pounds of casein is always subtracted from the yield. The constant casein loss factor really indicates that milk that contains more concentrated amounts of milk protein (and thus casein) will achieve better yield efficiencies from the protein in the milk. From a mathematical view, the negative yield factor resulting from casein loss would mean that cheese yield from protein would equal -0.1758 pounds, rather than zero, when no protein is present. Of course, no one would attempt to make Cheddar cheese without casein, so that situation is illogical. However, what the constant does mean is that under normal ranges of milk protein content, the Van Slyke expects a consistent casein loss per unit milk. That loss in cheese yield equals -0.1758 pound cheese per cwt. or -0.001758 pound cheese per pound milk, regardless of protein test.

This calculation shows if that the value of milk components were to be valued the same way as the Van Slyke, we have a negative value on volume of milk to adjust the casein loss constant of -0.1 lbs. per cwt. milk processed. In other words, processors would be paying for protein based on a higher protein factor, 1.3713, but would also deduct the equivalent value of 0.1758 lbs. cheese yield per cwt. milk shipped into Class III.

This method also shows that the marginal value of crude protein in cheese yield is 1.3713. This is correct, but it is very important to remember that simply multiplying fat times 1.582 and protein by 1.3713 will not result in the correct cheese yield. 0.1758 must be subtracted from the sum of the fat and protein factors to get the actual yield. Using the 1.3713 factor without adjusting for the casein loss factor will result in a consistent overestimation of yield by that 0.1758 pounds cheese. Table 2 below demonstrates this phenomenon:

Table 2. Calculating Cheese Yields from Marginal Yield Values for Fat and Protein, But Ignoring 0.1 Pounds Casein Loss per Cwt. Milk

Milk Composition		Van Slyke	Cheese Yield Estimate from Marginal Yield Factors			
Butter-Fat	Crude Protein	Cheese Yield 78% Casein	Milkfat (1.582259)	Protein (1.371291)	Predicted Yield	Difference From Van Slyke
3.50	2.80	9.2017	5.5379	3.8396	9.3775	0.1758
3.50	2.90	9.3388	5.5379	3.9767	9.5147	0.1758
3.50	3.00	9.4760	5.5379	4.1139	9.6518	0.1758
3.50	3.10	9.6131	5.5379	4.2510	9.7889	0.1758
3.50	3.20	9.7502	5.5379	4.3881	9.9260	0.1758
3.50	3.30	9.8874	5.5379	4.5253	10.0632	0.1758
3.50	3.40	10.0245	5.5379	4.6624	10.2003	0.1758
3.50	3.50	10.1616	5.5379	4.7995	10.3374	0.1758
3.50	3.60	10.2987	5.5379	4.9366	10.4746	0.1758
3.50	3.70	10.4359	5.5379	5.0738	10.6117	0.1758
3.50	3.80	10.5730	5.5379	5.2109	10.7488	0.1758

This chart shows that if the protein factor does not reflect casein loss in cheese it will over estimate cheese yields and that loss must be accounted for by subtracting 0.1758 pounds cheese per cwt. milk from the sum of the marginal yields for fat and protein.

Determining the Cheese Yield per Pound Milk Crude Protein when Casein loss is assigned to Protein:

When the original 1.32 protein factor was developed for the Upper Midwest MCP hearing in January, 1994, the method used to determine the protein price assigned the casein loss constant to the protein portion of the cheese yield equation, rather than to a constant with a negative value. In order to do this, the casein loss factor of 0.1 was subtracted from the AVERAGE protein content in milk, and the protein value was calculated based on the AVERAGE value per unit protein, rather than the MARGINAL value, which is reflected in the 1.3713 factor shown above. This was the method used to determine the protein factor adopted in the former Chicago Regional, Eastern South Dakota, Iowa, Nebraska-Western Iowa, Eastern South Dakota, Upper Midwest, and the Southern Michigan Federal Orders.

The steps used to derive such a cheese yield factor for protein, when the casein loss is assigned on a consistent per unit protein basis, rather than a per cwt. milk basis, is outlined below.

Step 1: Remove the Milkfat Portion of the Equation:

$$\textbf{CY from 3.2\# Protein} = \frac{[\,78.0\% \times 3.2\text{\# Protein} - 0.1] \times 1.09}{0.62}$$

Step 2: Solve for Protein @ Selected Protein Percentage

CY from 3.2# Protein = [78.0% x 3.2 - 0.1] x 1.09 / 0.62

CY from 3.2# Protein = 4.212323 lbs. cheese

Step 3: Divide by the Selected Protein Percentage:

CY from 1.0# Protein = 4.212323 / 3.2

CY from 1.0# Protein = 1.316351

Because the fat yield factor is not impacted by casein loss, the fat factor for Cheddar yield is still 1.5823 lbs. cheese per pound fat. Table 3 Below summarizes these factors when casein loss is assigned to protein.

Table 3. Milk Component Yield Factors under the Van Slyke Cheddar Yield Formula
Casein Loss Incremental on a Per-Unit Protein Basis:

Butterfat Factor for Cheese Yield:	1.582259	per lb. butterfat	Rounded:	1.5823
Protein Factor for Cheese Yield:	1.316351	per pound protein	Rounded:	1.3164

Using this protein factor or the previous one along with the casein loss adjustment will give you very nearly the same cheese yield, but the 1.316 factor will slightly overestimate yields at lower protein test and overestimate yields at higher test because it ignores vat efficiency differences between milk of higher and lower casein milk that the -0.1758 factor corrects for. However, yields between using the higher protein factor and the constant and using the lower protein factor are very small.

Yield Comparison Tables

Table 4 compares the predicted cheese yields from the Van Slyke formula using different casein loss methods. The calculated yield differences due to the different methods of casein recovery assumption are very small. Assigning the casein loss to milk (-0.1 factor) rather than protein (96% recovery factor) only changes yield over

the pound range in protein content by five hundredths of a pound. The cheese yield formulas used to calculate these yields are:

1. Van Slyke Formula using 0.1 lbs. Casein Loss per Cwt.: $\frac{(\text{Fat} \times 90\% + \text{Protein} \times 78\% - 0.1) \times 1.09}{1 - 38\%}$

2. Van Slyke Formula using 96% Casein Recovery: $\frac{(\text{Fat} \times 90\% + \text{Protein} \times 78\% \times 96\%) \times 1.09}{1 - 38\%}$

Table 4. Van Slyke Cheese Yield: Comparison of Casein Recovery Methods

Milk Composition		Casein Recovery Method		
		-0.1# Casein	96% Casein	Yield
Milkfat	Protein	Loss in CY	Recovery	Difference
2.80	2.80	8.0941	8.1164	(0.0222)
3.00	2.90	8.5477	8.5644	(0.0167)
3.20	3.00	9.0013	9.0125	(0.0113)
3.40	3.10	9.4549	9.4606	(0.0058)
3.60	3.20	9.9085	9.9087	(0.0003)
3.80	3.30	10.3620	10.3568	0.0052
4.00	3.40	10.8156	10.8049	0.0107
4.20	3.50	11.2692	11.2530	0.0162
4.40	3.60	11.7228	11.7011	0.0217
4.60	3.70	12.1764	12.1492	0.0271
4.80	3.80	12.6299	12.5973	0.0326

Table 5 calculates cheese yields based on the assumption that casein loss equals 0.1 lbs. per cwt. milk. This method infers that casein loss does not vary with milk protein composition, but rather is constant loss per cwt. The yields in this table match perfectly with the Van Slyke yields using the 0.1 factor. This is logical because the three factors were calculated from that formula. Yield differences between the component factors and the Van Slyke using 96% Casein Recovery method were consistent with the differences in yield between the two Van Slyke formulas compared in Table 2, ranging from 0.022 lbs. lower at 2.8% protein to .0326 lbs. higher at 3.8% protein, a spread of only five-hundredths of a pound cheese.

Table 6 calculates cheese yields from component values based on the assumption that casein loss is a constant percentage of protein content, rather than a fixed amount per cwt. Because the casein loss is assigned to protein, rather than to milk, there is no milk adjustment factor, only factors for fat and protein. The yields in this table closely follow the yields using the Van Slyke with a 96% Casein recovery factor, showing insignificant variation of three ten-thousandths of a pound per cwt.

Comparisons with the Van Slyke formula using the 0.1 pound casein loss factor again shows a yield variation ranging from plus two-hundredths of a yield at low protein content, to plus three-hundredths pounds lower yield at high protein content. The range in yield differences between the formulas from low to high protein content is only 5-hundredths different from the Van Slyke Cheese Yield Formula using the 0.1 factor.

Table 5. Calculation of Cheese Yields Using Van Slyke Component Values Based on Assigning 0.1# Casein Loss/Cwt. to Milk

Milk Composition		Yield from Butterfat	Yield from Protein	Yield from Cwt. Milk	Total Cheese	Difference From Van Slyke: -0.1 Casein	96% Casein
Milkfat	Protein	1.582259	1.371291	-0.175807	Yield	Loss in CY	Recovery
2.80	2.80	4.4303	3.8396	-0.1758	8.0941	0.0000	-0.0222
3.00	2.90	4.7468	3.9767	-0.1758	8.5477	0.0000	-0.0167
3.20	3.00	5.0632	4.1139	-0.1758	9.0013	0.0000	-0.0112
3.40	3.10	5.3797	4.2510	-0.1758	9.4549	0.0000	-0.0058
3.60	3.20	5.6961	4.3881	-0.1758	9.9085	0.0000	-0.0003
3.80	3.30	6.0126	4.5253	-0.1758	10.3620	0.0000	0.0052
4.00	3.40	6.3290	4.6624	-0.1758	10.8156	0.0000	0.0107
4.20	3.50	6.6455	4.7995	-0.1758	11.2692	0.0000	0.0162
4.40	3.60	6.9619	4.9366	-0.1758	11.7228	0.0000	0.0217
4.60	3.70	7.2784	5.0738	-0.1758	12.1764	0.0000	0.0272
4.80	3.80	7.5948	5.2109	-0.1758	12.6299	0.0000	0.0326

Table 6. Calculation of Cheese Yields Using Van Slyke Component Values Based on Assigning Casein Loss To Protein

Milk Composition		Yield from Butterfat	Yield from Protein	Yield from Cwt. Milk	Total Cheese	Difference From Van Slyke: -0.1 Casein	96% Casein
Milkfat	Protein	1.582259	1.316351	0.000000	Yield	Loss in CY	Recovery
2.80	2.80	4.4303	3.6858	--	8.1161	0.0220	-0.0002
3.00	2.90	4.7468	3.8174	--	8.5642	0.0165	-0.0003
3.20	3.00	5.0632	3.9491	--	9.0123	0.0110	-0.0003
3.40	3.10	5.3797	4.0807	--	9.4604	0.0055	-0.0003
3.60	3.20	5.6961	4.2123	--	9.9085	0.0000	-0.0003
3.80	3.30	6.0126	4.3440	--	10.3565	-0.0055	-0.0003
4.00	3.40	6.3290	4.4756	--	10.8046	-0.0110	-0.0003
4.20	3.50	6.6455	4.6072	--	11.2527	-0.0165	-0.0003
4.40	3.60	6.9619	4.7389	--	11.7008	-0.0220	-0.0003
4.60	3.70	7.2784	4.8705	--	12.1489	-0.0275	-0.0003
4.80	3.80	7.5948	5.0021	--	12.5970	-0.0330	-0.0003

In summary, both of the Van Slyke Cheese Yield methods discussed in this paper can provide a reasonable estimate for Cheese Yield. Similarly, both of the milk component valuation methods derived from the Van Slyke can provide a reasonable yield estimate. If a component method to determine yield is used, either the protein or the milk factor must reflect the yield loss due to casein.