



## May 2011 Transportation Analysis

### Methodology

This study analyzes the hauling assessments paid by milk producers and the delivery distance to the first delivery point of milk marketed by producers pooling on the Midwest Marketing Area, Federal Order 33 (FMMO 33), during May 2011.

Hauling assessments represent the transportation costs incurred by the milk producer when transporting raw milk from the farm. Many of the observed assessments likely include stop charges incurred by the milk producer. Stop charges are a function of farm pickups and do not represent farm to plant transportation expenses. The hauling assessments appearing on the producer payrolls do not necessarily reflect the total costs of farm pickup and delivery to the plant.

For this study delivery distances were approximated using the shortest hard surface highway distance from the county seat of the applicable producer to the actual location of the receiving plant. No attempt was made to account for milk reloads or to estimate milk assembly miles. Assembly miles are miles traveled to collect the raw milk.

### Data

There were 5,530 producers included in this analysis and the geographical region encompassed in this population includes: Illinois, Indiana, Kentucky, Maryland, Michigan, New York, Ohio, Pennsylvania, West Virginia and Wisconsin.

The data includes only producers whose payroll information was submitted electronically. For the purposes of calculating representative weighted averages, producers with depooled milk, and who pooled milk on multiple orders were included in this analysis provided they also pooled milk on FMMO 33 during May 2011. As a result, there is a significant difference in the number of producers and delivery volume in this study and the number of producers and delivery volume as pooled on FMMO 33 during May 2011.

### May 2011 Summary

The producers included in this study marketed approximately 1.22 billion pounds of milk in May 2011, and the average delivery volume was 221,357 lbs.

**Table 1. Transportation Statistics FMMO 33, May 2011 and May 2010**

	May 2011	May 2010
Milk Marketings	1,224,104,590	1,241,660,074
Total Hauling Assessments (\$)	6,582,848.24	6,233,739.55
<b>Weighted Average</b>		
Hauling Assessment (\$)	5,674.35	4,400.01
Hauling Assessment (\$/cwt)	0.5378	0.5020
Delivery Distance (miles)	107.3	105.0
Mileage Rate Factor (\$/cwt/mile)	0.0152	0.0145
<b>Simple Average</b>		
Hauling Assessment (\$)	1,190.39	1,099.04
Hauling Assessment (\$/cwt)	0.7529	0.7166
Delivery Distance (miles)	82.6	87.8
Mileage Rate Factor (\$/cwt/mile)	0.0250	0.0243

During May 2011, total hauling assessments paid by producers included in this analysis was approximately \$6.6 million dollars.

The market wide May 2011 weighted average hauling assessment was \$5,674.35, \$1,274.34 more than May 2010. The weighted average hauling assessment per cwt was 53.78 cents, 3.57 cents higher than May 2010.

The weighted average delivery distance was 107.3 miles, 2.3 miles greater than the May 2010 weighted average.

The weighted average mileage rate factor (MRF) was 1.52 cents per cwt per mile, marginally higher than May 2010.

For comparative purposes Table 1 contains descriptive statistics for May 2011 and 2010. Data for previous years are available online at [www.fmmaclev.com](http://www.fmmaclev.com).

The weighted average calculation puts comparatively less weight on producers with little delivery volume. Therefore, when comparing the weighted average and (next page)

the simple average for each category it becomes apparent that smaller producers tend to have lower total hauling assessments, higher hauling assessments per cwt, shorter delivery distances and higher per cwt per mile hauling assessments.

### Transportation Analysis by Percentile Group

In order to examine the impact producer size has on hauling assessments and delivery distance; producers associated with the marketing area were divided into 10 equally sized percentile groups. Percentile groups were determined using producer identification codes and delivery volume. There were 5,530 producers included in this study, so each percentile group contained 553 producers. Percentile group one represents producers with the smallest delivery volume and group ten represents producers with the largest delivery volume.

Weighted average hauling assessments by percentile group ranged from \$227.79 for producers in percentile group one to \$9,326.03 for producers in percentile group ten. Of the \$6.6 million dollars paid by the producers included in this study, producers delivering the largest volumes of milk (percentile group ten) paid approximately 45 percent of the assessments and accounted for more than 55 percent of the 1.2 billion pounds delivered. Figure one details percentages of hauling assessments and delivery volume by percentile group.

Weighted average hauling assessments per cwt ranged from \$1.2010 per cwt for producers in percentile group one to 43.65 cents per cwt for producers in percentile group ten. The decline in per cwt assessments as delivery volume increases indicates the presence of diminishing marginal costs in milk transportation. Similar relationships between the hauling assessment and delivery volume were also observed in the findings of Freije and Espe of the Upper Midwest and Pacific Northwest orders, respectively.

Weighted average delivery distances were similar among many of the percentile groups. The observed increase in

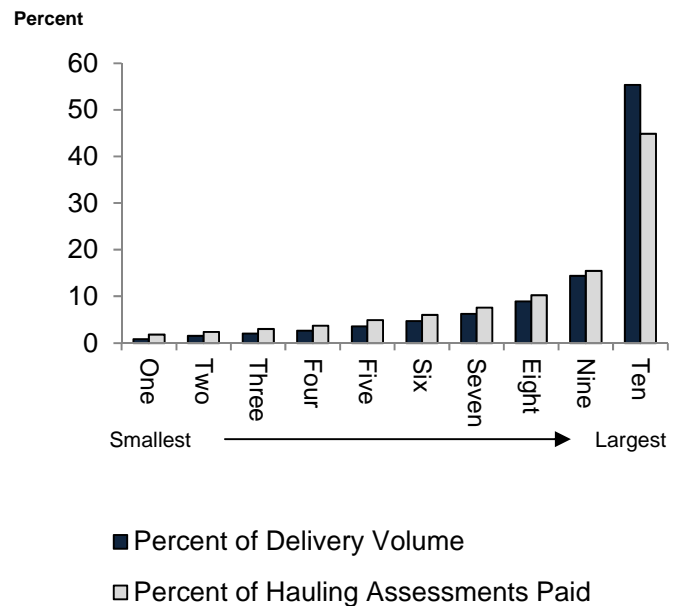
the weighted average delivery distance for producers delivering the largest quantities of milk is likely a function of multiple factors including, but not limited to their ability to direct ship from the farm.

Weighted average MRF ranged from 3.75 cents per cwt per mile for producers in percentile group one to 0.80 cents per cwt per mile for producers in the largest percentile group.

In order to put the percentile groups into perspective consider that the top three percentile groups (eight, nine and ten) accounted for more than 79 percent of the milk included in this analysis. Additionally, the top percentile group alone accounted for more milk than the total class I milk volume pooled on FMMO 33 during May 2011 (524 million lbs).

**Figure 1. Percentages of Hauling Assessments Paid and Milk Delivery Volume by Percentile Group**

**FMMO 33, May 2011**



**Table 2. Weighted Average Transportation Statistics by Percentile Group, May 2011**

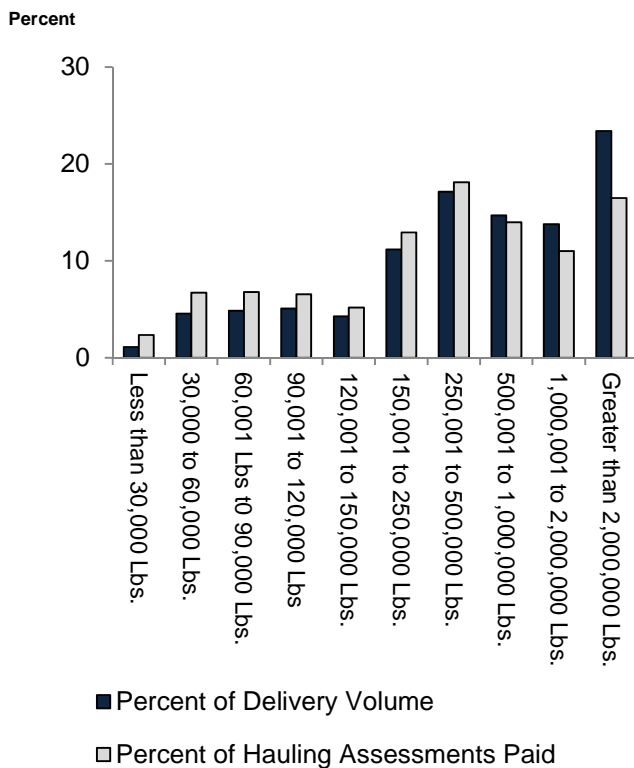
Percentile Group	Delivery Volume	Average Delivery Volume	Total Hauling Assessment	Total Hauling Assessment	Delivery Distance	Mileage Rate Factor
			\$	\$/cwt	miles	\$/cwt/mile
One	9,920,550	17,940	227.79	1.2010	89.7	0.0375
Two	18,233,429	32,972	285.65	0.8621	84.1	0.0263
Three	24,885,393	45,001	362.46	0.8005	76.0	0.0224
Four	32,757,500	59,236	446.64	0.7479	80.1	0.0195
Five	43,204,171	78,127	583.61	0.7422	79.0	0.0277
Six	56,935,565	102,958	720.17	0.6962	73.6	0.0330
Seven	76,166,235	137,733	905.80	0.6534	77.7	0.0230
Eight	108,962,490	197,039	1,233.97	0.6187	80.9	0.0225
Nine	176,135,883	318,510	1,887.13	0.5786	84.3	0.0218
Ten	676,903,374	1,224,057	9,326.03	0.4365	128.9	0.0080
Weighted Average			5,674.35	0.5378	107.3	0.0152

## Transportation Analysis by Delivery Volume

In order to examine the impact producer size has on hauling assessments and delivery distance, producers associated with the marketing area were categorized by their delivery volume. Producers with similar delivery volumes were grouped together. The delivery volume categories are identified in table three below. For future transportation analyses categorizing producers based on delivery volume ranges will replace percentile group categorization. This change will allow producers to identify which delivery volume category their farm operation is in.

Weighted average hauling assessments by delivery volume ranged from \$238.03 for producers delivering less than

**Figure 2. Percentages of Hauling Assessments Paid and Milk Delivery Volume by Milk Delivery Volume FMMO 33, May 2011**



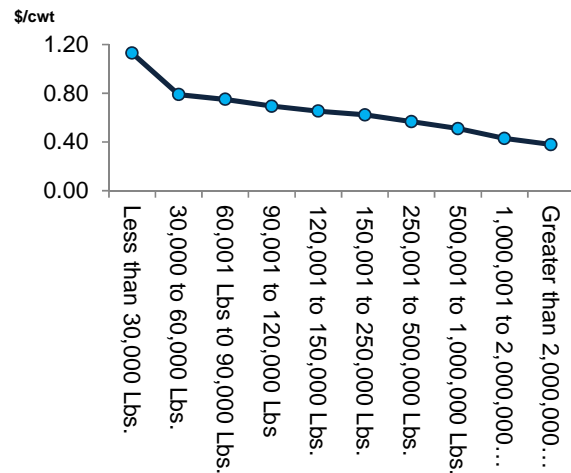
30,000 lbs to \$15,919.54 for producers delivering more than 2 million lbs. Of the \$6.6 million dollars paid by the producers included in this study, producers marketing more than 2 million lbs of milk paid approximately 45 percent of the assessments and accounted for more than 55 percent of the 1.2 billion pounds delivered. Figure two details percentages of hauling assessments and delivery volume by size category.

Weighted average hauling assessments per cwt ranged from \$1.1294 per cwt for producers delivering less than 30,000 lbs to 37.93 cents per cwt for producers delivering more than 2 million pounds of milk.

Weighted average delivery distances were similar among many of the delivery volumes. The observed increase in the weighted average delivery distance for producers delivering the largest quantities of milk is likely a function of multiple factors; including, but not limited to their ability to direct ship from the farm.

Weighted average MRF ranged from 3.88 cents per cwt per mile for producers delivering less than 30,000 lbs to 0.42 cents per cwt per mile for producers delivering more than 2 million pounds.

**Figure 3. Hauling Assessments By Cwt by Milk Delivery Volume, FMMO 33, May 2011**



**Table 3. Weighted Average Transportation Statistics by Delivery Volume, May 2011**

Percentile Group	Delivery Volume	Farm Count	Total Hauling Assessment	Total Hauling Assessment	Delivery Distance	Mileage Rate Factor
			\$	\$/cwt		miles
Less than 30,000 Lbs.	13,629,480	684	238.03	1.1294	86.3	0.0388
30,000 to 60,000 Lbs.	55,820,802	1,271	355.85	0.7894	79.7	0.0219
60,001 Lbs to 90,000 Lbs.	59,460,758	809	557.79	0.7500	79.3	0.0251
90,001 to 120,000 Lbs.	62,234,189	598	725.53	0.6936	73.0	0.0351
120,001 to 150,000 Lbs.	52,145,116	388	879.38	0.6533	78.7	0.0214
150,001 to 250,000 Lbs.	136,590,795	710	1,222.04	0.6233	81.6	0.0215
250,001 to 500,000 Lbs.	209,586,058	609	2,018.39	0.5680	83.3	0.0199
500,001 to 1,000,000 Lbs.	179,809,274	262	3,648.73	0.5107	83.9	0.0116
1,000,001 to 2,000,000 Lbs.	168,741,545	123	5,916.30	0.4295	106.5	0.0099
Greater than 2,000,000 Lbs.	286,086,573	76	15,919.54	0.3793	177.3	0.0042
Weighted Average			5,674.35	0.5378	107.3	0.0152

## Transportation Analysis by State

For this section transportation statistics were analyzed by the state. Milk from ten states was included in this analysis; of the ten states, Ohio, Michigan, Indiana, West Virginia, Kentucky and Pennsylvania are states located or partially located within FMMO 33.

Producer size varies dramatically throughout the region. Producer size is estimated using average delivery volume. Average delivery volume ranges from 64,401 pounds for producers in Kentucky to 349,298 pounds for Michigan producers.

Indiana producers pooling on FMMO 33 had the highest weighted average hauling assessment at \$10,325.60 which was \$4,651.25 higher than the market weighted average. Wisconsin producers pooling on FMMO 33 had the lowest weighted average hauling assessment at \$411.22, which was \$5,236.12 less than the market weighted average.

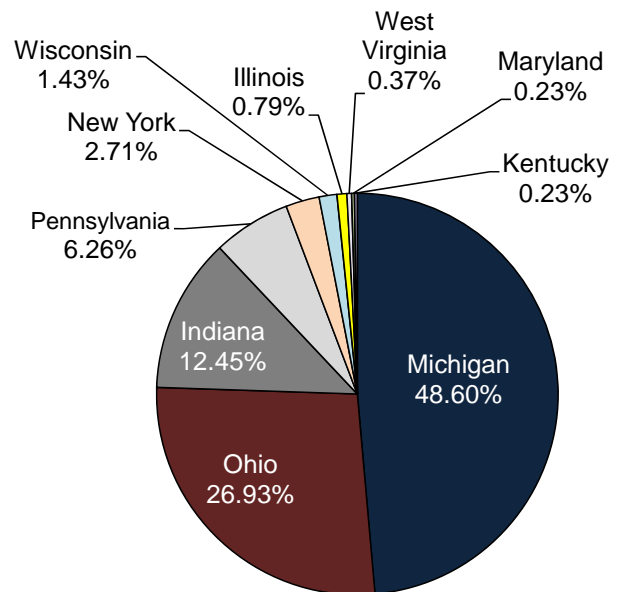
Weighted average hauling assessments per cwt ranged from \$0.1260 for Wisconsin producers to \$1.1192 for producers in Maryland. The low weighted average hauling assessment observed for Wisconsin is supported by the findings of the Upper Midwest marketing area. Research by the Upper Midwest indicated that weighted average hauling assessments per cwt for Wisconsin producers was 21.63 cents per cwt during May 2010. There is a significant difference in the hauling assessment for Wisconsin producers compared to producers in other states. Stop and volume assessments often are used as negotiating tools by cooperatives, handlers and haulers when attempting to procure additional milk supplies. Since Wisconsin has a large population of dairy producers within close proximity of each other it is likely that the competitive landscape (agglomeration effect) has helped to bid down hauling assessments for producers in that region. Another contributor to the low hauling assessments could be the low

weighted average delivery distance associated with Wisconsin milk.

Weighted average delivery distances ranged from a low of 40.9 miles for producers in Illinois to 145.3 miles for producers in West Virginia. Delivery distance is a function of pooling practices and supply locations. For example, a portion of the milk from states outside the marketing area could be diverted milk pooled on FMMO 33 but not delivered to facilities located within the FMMO 33 geographical region, resulting in a lower weighted average delivery distance.

Weighted average MRF ranged from a low of 0.33 cents per cwt per mile for Wisconsin producers to a high of 4.23 cents per cwt per mile for Pennsylvania producers.

**Figure 4. Percent of Delivery Volume by State FMMO 33, May 2011**



**Table 4. Weighted Average Transportation Statistics by State, May 2011**

State	Delivery Volume	Average Delivery Volume	Farm Count	Total Hauling Assessment	Total Hauling Assessment	Delivery Distance	Mileage Rate Factor
				\$	\$/cwt	miles	\$/cwt/mile
Illinois	9,708,249	206,558	47	1,804.14	0.2792	40.9	0.0069
Indiana	152,430,283	160,961	947	10,325.60	0.7041	112.6	0.0322
Kentucky	2,769,237	64,401	43	873.85	0.8886	116.4	0.0108
Maryland	2,835,761	65,948	43	917.06	1.1192	100.5	0.0155
Michigan	594,854,682	349,298	1,703	5,407.74	0.4279	116.6	0.0091
New York	33,180,601	307,228	108	7,755.29	0.6442	88.1	0.0094
Ohio	329,616,597	191,304	1,723	5,199.93	0.5947	103.7	0.0136
Pennsylvania	76,614,876	101,881	752	1,934.87	0.8388	66.1	0.0423
West Virginia	4,542,879	164,032	57	1,307.51	0.9300	145.3	0.0157
Wisconsin	17,551,425	79,700	107	411.22	0.1260	58.9	0.0033
Weighted Average				5,674.35	0.5378	107.3	0.0152



## Regression Analysis

OLS regression analysis was used to estimate the relationship between hauling assessments paid by producers pooling on FMMO 33 and delivery volume, delivery distance, and competition.

The model is given by:

$$Y = F(\text{Pounds, Farms, Delivery Criteria, Competition})$$

## Model Results

Model one and model two differ only in how the delivery distance is captured. In model one actual delivery miles are used as an independent variable and in model two binary variables capturing the proximity to a processing plant are used as independent variables.

Results of the models indicate that hauling assessments paid by producers are a function of delivery volume, proximity to a processor and transportation conditions.

Hauling assessments are positively correlated with delivery volume; however, hauling assessments increase at a diminishing rate as reflected in the negative coefficient on pounds squared. The computed delivery volume elasticities for each of the two models were approximately 0.92 and 0.93 percent, respectively. The elasticity represents the percentage change response in the assessment paid by the producer corresponding to a one percentage change in delivery volume, holding all else constant. The elasticity is calculated by taking the partial derivative of the estimated model and evaluating it using the sample means.

Hauling assessments are positively correlated with topography near the farm. Topography was a binary variable included in the model to capture the effect of terrain on hauling assessments. Producers located in counties with sloped terrain paid on average between \$191 and \$257 more in hauling assessments relative to producers located in counties with flat terrain, holding all else constant.

Hauling assessments are negatively correlated with the proximity to a milk processor (fluid or manufacturing). The binary variable for U10 (processor within ten miles) was significantly negative. The effect of a processor within 50 miles was not statistically significant. A processor within ten miles led to a \$246 decrease in hauling assessments, holding all else constant.

The model results indicate a positive coefficient on delivery distance. The coefficient was statistically significant with a p value of 0.14. This indicates that as delivery distance increased the hauling assessment also increased, holding all else constant.

The significantly negative coefficient for farm count supports the hypothesis that farms in counties with a large

**Table 8. OLS Regression Results, Determinants of Hauling Assessment**

**FMMO 33, May 2011**

	Model One	Model Two
Intercept	-146.07 (259.27)	271.81 ** (103.91)
Pounds	0.00509 ** (0.00)	0.00515 ** (0.00)
Pounds Squared	-3E-10 * (0.00)	-3E-10 ** (0.00)
Distance Criteria		
Delivery Miles	3.58 (2.39)	
Under 10 Miles		-245.80 ** (92.22)
Under 50 Miles		-104.70 (101.72)
Topography	256.50 ** (66.90)	190.81 ** (21.61)
Producer Count	-1.19 ** (0.30)	-1.28 ** (0.41)
R-Squared	0.35	0.34

1/ Heteroskedasticity consistent standard errors in parenthesis; \*p < 0.05; \*\*p < 0.01; (N=5,530)

assessments. This is likely due to positive network externalities such as increased competition among handlers and haulers for milk supplies, and improved efficiency in milk assembly.

## Conclusion

The data included in this analysis indicates that hauling assessments vary significantly due to multiple factors. Factors influencing hauling assessments include delivery pounds, topography, the proximity to a processing plant and competition for milk supplies. Factors influencing milk transportation but not quantified in this analysis likely include fuel prices, state regulations, nature of milk supply and processor demand among others.

Transportation costs will continue to be an important concern throughout the industry. Producers and handlers share in the cost of moving raw milk, intermediate goods and finished products along the supply chain; as a result effectively managing these costs is essential in order to ensure that an adequately supply of milk is available to meet the demands of the consumer.