Graphically Speaking

Supply Chain Management & Production Agriculture:

A Florida Dairy Case

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Technological innovation and competition have led to improvements in supply chain management for food products. Supply chain improvements reduce inventories, waste, and costs, and thus increase efficiency within the firm and the market channel.

Moving Milk in Florida

Achieving these gains requires mobility and flexibility in the scheduling and location of production processes, inventories, and distribution. This can be achieved through supportive and cooperative supplier-buyer relationships sometimes called "vertical coordination."

Inventory management in production agriculture, however, is a special challenge. Inventory and production decisions lag behind demand signals because of the lead time required, and products are usually perishable. The objective of this article is to discuss the impact of delivery schedules on the inventory management of the Florida Dairy Marketing Cooperative (FDMC).

The Dairy Case

The FDMC uses full supply contracts to provide farm or unprocessed milk to fluid milk processors. Processors place orders with the FDMC for varying daily quantities of milk, to be delivered in the following week. Processors may also order additional deliveries or cancel already scheduled deliveries with 24 hours' notice. The FDMC buys and sells unprocessed milk when it is unable to maintain optimal inventory levels from local member production.

FDMC sells surplus milk to manufacturers of butter, cheese, and non-fat dry milk, receiving four to five dollars per hundredweight less than milk sold to Florida fluid milk processors. This price is further reduced by the cost for transporting the milk to manufacturers in other states.

When inventory levels are low, the FDMC buys milk from non-FDMC members at a premium of one to eight dollars above that paid by Florida fluid milk processors. The FDMC negotiates with processors to offset part or all of the higher prices.

The length of time unprocessed milk can remain in inventory is tightly regulated by state and federal agencies. The FDMC has 72 hours to deliver milk to a fluid milk processing plant. The fluid milk processor then has 72 hours in which to produce packaged fluid milk products, which must be sold to consumers at retail before the "sell by date" stamped on the package by processors.

Weekly Delivery Schedules

Some processors negotiate to receive milk on a "non-continuous" basis, or fewer than seven days per week. Seven-day delivery schedules may not be any easier to manage — the quantity of milk delivered often differs from one day to the next, in such a "continuous non-uniform" schedule.

During the 1990s, the FDMC encouraged processors to accept deliveries of milk on a continuous uniform (equal quantities delivered seven days per week) schedule by offering a price incentive ($0.35 per hundredweight as of 1998). However, a continuous non-uniform schedule evolved over time, even though the price discount remained in effect. This served to raise inventory management costs without increasing revenue.

Delivery schedule agreements in the Florida milk industry have profound effects on cost structure and profitability.

Additional Transfer Costs[a] for Non-continuous Uniform Delivery and Continuous Non-uniform Delivery Compared to a Continuous Uniform Delivery by the Florida Dairy Marketing Cooperative.

Cost Category and Milk Volume	Delivery Schedules	
	Non-Continuous Uniform	Continuous Non-Uniform
Fixed cost[b]		
Weekly	$23,667	$2,654
Per 100 lbs. of total volume[c]	$0.0697	$0.0078
Variable cost[d]		
Weekly	$12,549	$2,098
Per 100 lbs. of total volume	$0.0370	$0.0062
Total additional transfer cost[e]		
Weekly	$36,217	$4,752
Per 100 lbs. of total volume	$0.1067	$0.0140
Total milk volume		
Weekly (hundredweight)	339,360	339,360
Inventory		
Weekly (hundredweight)	193,920	27,360
Percent of total weekly volume	57.14%	8.06%

[a] The costs in this table are the costs in excess of a benchmark continuous-uniform delivery schedule

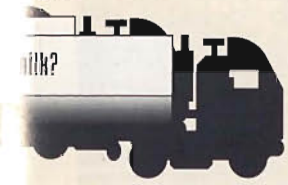
[b] Includes interest and depreciation for additional tractors, trailers, and parking requirements as well as other recurring ownership costs such as insurance.

[c] Total volume is the average quantity of milk the FDMC collects and delivers during a seven-day period.

[d] Variable costs include items such as fuel, tires, maintenance, wages, taxes, employee insurance, and related items.

[e] Total transfer cost is equal to the sum of fixed cost and variable costs.

Non-continuous and non-uniform milk delivery involve additional transportation, storage, transaction, and management costs to the FDMC. For example, compare two of many possible delivery schedules with a benchmark schedule. The benchmark schedule represents the least-cost or "natural" timetable for the FDMC deliveries, where uniform quantities of milk are delivered to processors every day. The two alternative schedules consist of a non-continuous uniform schedule and a continuous non-uniform schedule. All three schedules deliver the same volume of milk.



Delivery Costs Tabulated

The table shows the additional transfer costs associated with a non-continuous uniform delivery schedule. A total 193,920 hundredweight of milk (57.14 percent of average total weekly volume) moved under this schedule. Compared to the benchmark schedule, total transfer costs increased by $0.1067 per hundredweight, or $36,217 per week at the time (1998) of this analysis. Fixed costs represented almost two-thirds of this increase. Variable costs increased by $0.0370 per hundredweight.

The seven-day non-uniform schedule resulted in a much smaller cost increase of just $4,752 per week for the FDMC, because only 27,360 hundredweight were in inventory. As a result, the cost increase on a unit basis was only $0.0140 per hundredweight.

Processor

Summary and Conclusions

Technological innovations and competitive pressures have encouraged retailers and processors to improve supply chain management for agricultural products. This often requires more refined vertical coordination and inventory management between stages in the market channel. Inventory management in production agriculture, however, is a challenge because producers must set production well before they can determine actual demand.

We found that a non-continuous (five-day) delivery schedule with uniform deliveries increases transfer costs for the dairy marketing cooperative by $0.1067 per hundredweight of total milk volume. A continuous non-uniform delivery schedule increased transfer cost by $0.0140 per hundredweight.

Over time, the movement from a five day to a seven day delivery schedule has reduced the costs associated with inventories and has increased the freshness of inventory at the processor level, demonstrating that supply chain management can have an impact on the FDMC and its members.

Consumer