

Tasty Waste? ...No, Whey!

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Agricultural wastes are mostly just resources out of place. These wastes tend to be inputs (nutrients or chemicals) that reach the environment unused. The solution for these underdeveloped resources is to identify ways to use them more completely. It is an efficiency problem – not a compliance problem.

Whey, an underused product of cheese making, has literally gone from disposal in sewers to use as food additives in soup. To understand what it takes to change a resource from a disposal problem to a high value product, it is useful to look at the factors that have shaped the increased value of whey and whey products.

Roger Cryan¹, Director of Economic Research for the National Milk Producers Federation, chronicled the shifts in whey management from disposal of whey solids in sewers to refinement of whey solids as valuable food additives. This is an excellent case study to highlight the things that must be done to move manure from its perception as a waste to one as a resource.

U. S. Cheese production has more than doubled since 1975. Nine pounds of whey are produced for every pound of cheese. Whey is mostly water (93%), but a half pound of solids remain in the whey for each pound of cheese produced. These solids can provide value, but it is not easy to get to that value in the form that it comes in from the cheese vat.

Whey Economics, A Case of Supply and Demand. When the supply of whey overwhelms the demand for whey, the price of whey goes to zero. If the handling costs of whey also increase, then whey becomes an economic liability. It becomes a waste. As long as the supply of whey can be balanced with the demand for whey, disposal costs of whey will be near zero. If demand for whey and whey products increase, the value of whey also increases. This whey waste-to-resource story is worth telling because cheese production is increasing, so whey production is also increasing (nine pounds of whey for every pound of cheese). Even with more surplus whey, the demand for whey and whey product is still increasing.

This is no small achievement and the story is not over. In the past year, increased cheese production has created a whey surplus. Demand has not kept up and the value of whey is again low. When demand increases, the value of whey will recover.

A Brief History of Whey Use

- When milk was handled in 10-gallon milk cans, milk was delivered to the cheese plant in the cans and whey was sent back to the farm in the milk cans. That pretty much solved the disposal cost of the cheese plant. For the farmer, one hundred pounds of fluid whey had about as much nutritional value as a quarter bushel of corn (14 pounds). *The disposal cost for the cheese plant was near zero.*
- The shift to bulk tanks eliminated the low cost whey disposal in 10-gallon backhauls. Whey began to be disposed of where it could like the municipal sewer systems. *Before widespread regulation, the disposal cost was still nearly zero.*
- With larger plants and increased regulation there were increased volumes of whey with larger disposal costs. As cheese plants began to pay for disposal, the value of whey became negative. *The effective price of a pound of whey was less than zero. The economics forced cheese producers to find different, more efficient uses for fluid whey.*
- Today, most of the fluid whey is processed for animal feeds with a growing demand for food uses of whey. Technology and demand have cultivated markets for whey lactose and whey proteins - multiple markets from the same quantity of whey solids. *Total demand for processed whey products is increasing the value of the next best use for whey solids.*

¹ The original material on the value of whey came from, "Whey: Ready for Takeoff?" by Roger Cryan in U.S. Dairy Markets & Outlook, Vol. 7 No 3, August 2001. Located at http://www.nmpf.org/files/US_Outlook_August_01.doc.

- New technologies allow solids to be fractionated relatively inexpensively. Whey solids are high in lactose (milk sugar) with some protein. Milk replacers for pigs and calves are a principal feed market for whey solids.
- Commercial baking and confectionery industries have found uses for dried whey solids in their food products to enhance flavor and quality.
- New technology and increased demand have created a class of high-valued whey protein concentrate products (WPC).
- New uses of whey solids have developed in higher-valued markets for pharmaceuticals, infant formulas and even anti-bacterial treatments for meat. In 2000, 435 million pounds of whey products were exported to other countries.

Lessons to Take Home

1. Whey economics are driven by how closely the demand for whey matches the supply of whey. The solution to capturing the unrealized value of whey lies in market development and economics not in environmental compliance. Whey is, and always has been, a residual food product. The earlier disposal of whey through the sewer systems was an economic decision.
2. Efficiency and innovation have greater impacts on surplus nutrients and energy than does compliance. Compliance costs may have increased the negative price for whey (disposal costs), but it has been gains in efficiency and innovation that have increased the positive price.
3. Separation of different whey components (water, protein and lactose) has diversified the markets available for multiple whey products.
4. Product definitions such as whey protein concentrate (WPC) reduce the cost of using these materials because the product names convey useful information (WPC-45 has a protein content of 45%).
5. The increased value of whey and whey product contributes to cheese production economic success, but it is not an industry economic windfall. The increased value and revenues cover the cost of technical innovation. The increased revenues are greater than the increased costs.
6. Change takes time. Dr. Cryan used data back to 1975 to illustrate the points in his paper.

Our government regulatory programs must encourage efficiency and innovation. Current environmental policies often destroy efficiency and innovation with a simplistic, single focus of regulatory compliance. The solutions to resource and environmental issues are found in increased economic value and use – not in greater restrictions and conservation. This case study of the gains in whey processing and marketing provide an excellent example of how increasing the demand for a surplus resource moves it from a waste to a positive good for the economy.