Minimum dairy pricing policy could expand milk production, affect water quality

September 4 2023, by Katie Bohn

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A dairy pricing policy originally proposed at the beginning of the COVID-19 pandemic could have resulted in dairy farmers getting 10% more for their products if the policy had been passed, according to a

Penn State study.

The research, led by College of Agricultural Sciences researchers and based on a model of livestock production in the Chesapeake Bay watershed, found that this price increase could have led to an approximately 13% expansion of the local dairy industry.

Additionally, the model suggested that an increase in livestock production also would lead to an increase of manure leaching into the waterways, which would result in more nitrogen emissions but fewer phosphorus emissions. The findings were published in the *Journal of the Agricultural and Applied Economics Association*.

"Our findings give insight into how pricing policy could impact regional livestock production in the U.S., including during times of crisis," said Zeya Zhang, a research fellow at the University of Auckland who worked on the study while he was a postdoctoral researcher at Penn State. "Such policies can have not only economic effects, but environmental ones, as well."

According to the researchers, the beginning of the COVID-19 pandemic in 2020 caused milk prices to plummet as schools and restaurants closed. In response, the Dairy Cooperative Marketing Association asked the U.S. Department of Agriculture (USDA) to establish a minimum pricing policy, effective through the summer of that year, to help struggling dairy farmers.

While the request was rejected, the researchers said a minimum pricing policy continues to be appealing to farmers. They said that the COVID-19 pandemic, when combined with the effects of a milk pricing formula introduced in a farm bill that took effect in April 2019, led to an estimated $725 million loss for milk producers.

They added that higher minimum prices for dairy farmers could also mean higher costs for processors of milk, cheese, butter and other dairy products, and most of those costs are passed on to consumers. However, higher minimum prices also mean more predictability for processors and price stability for consumers.

David Abler, professor of agricultural, environmental and regional economics, and demography, said the research team wanted to create a model to study both the short-term and the long-term effects of a dairy pricing policy like the one proposed at the beginning of the COVID-19 pandemic.

"Novel changes in public policy—such as the ones in the 2018 Farm Bill—can have unforeseen side effects, like worsening market slumps rather than improving them," Abler said. "It's important for public policies to have flexibility built into them for when things don't turn out as planned."

Abler explained that they wanted to examine how such a policy would affect not just milk prices, but water quality, as well. If the policy resulted in increased dairy production—and therefore, increased livestock production—the researchers reasoned that water quality could be affected by an increase in livestock manure entering waterways.

For the study, the researchers created a model analyzing 10 regions in the Chesapeake Bay watershed—an area that has both a large livestock industry and close proximity to waterways.

The model included six major livestock sectors—dairy, beef cattle, swine, broiler, egg and turkey—and incorporated data from multiple sources in addition to USDA's Agricultural Census, including information about feed composition, price and supply elasticities. The researchers first ran the model to get baseline results and then again after

imposing the minimum pricing policy, reflected as an increase to milk price.

"We can then quantify the changes in livestock production, input usage level and farmer profitability induced by the pricing policy," Zhang said. "Based on the livestock model results, we can further calculate the environmental outcomes of the policy, such as how much more or less nitrogen is generated from the livestock industries."

In addition to an expanded dairy industry, the researchers found that the policy resulted in a 2% to 10% increase in total net revenue for the livestock farmers in the 10 study regions, with some benefiting more than others depending on a region's initial composition.

"In the model, local livestock farmers would respond to the price change by reallocating their resources from other livestock sectors to the dairy sector," Abler said. "In some regions the beef cattle industry would shrink, while in others, broiler and turkey sectors shrink."

The researchers said future studies could expand the model to analyze policy even more broadly, such as examining the potential effects of policies directed at greenhouse gas emissions from livestock and feed crop production. Or, studies could include crops in the model to estimate how changes in fertilizer applications could affect water quality.

More information: Zeya Zhang et al, Dairy pricing policy, production, and water quality: Application to the Chesapeake Bay watershed, *Journal of the Agricultural and Applied Economics Association* (2023). DOI: 10.1002/jaa2.62

Provided by Pennsylvania State University