RESERACH UPDATE

By Jean Bonhotal, Ellen Harrison, Mary Schwarz and Ed Staehr

Scarcity of dairy bedding sources has prompted more dairies to bed with dairy manure solids

Dairy manure solids cut bedding costs

If dairy manure solids (DMS) are a dairy's bedding choice, and they're managed well, producers could be saving money. That's one conclusion from a study on bedding with DMS. Five dairies in the study, that submitted financial data, saved an average of $37,000 annually.

The research, conducted by Cornell Waste Management Institute (CWMI), assessed the impact of using DMS as bedding on herd health and the dairies' economics. The study also looked at the environmental impact of DMS. Funding came from the New York State Energy Research and Development Authority (NYSERDA), the New York Farm Viability Institute, Cornell Cooperative Extension and the College of Agriculture and Life Sciences at Cornell.

We're still analyzing and interpreting data on the cow-side factors related to DMS as bedding, such as bacteria on teat ends and lameness. Those findings will appear in a future *Northeast DairyBusiness* issue. The economic data is presented here.

Jean Bonhotal of the Cornell Waste Management Institute checks the dairy manure solids used as bedding on a Northeast dairy.

Bedding dairy cows is costly and time-consuming. The cost and availability of bedding fluctuates, and good consistent bedding can be expensive and hard to find. In some areas of the Northeast, securing conventional bedding, such as sawdust and straw, is increasingly difficult. Well-managed sand can be good for herd health but hard on equipment.

Caught in this bind, more dairies have turned to DMS as a bedding source. But farmers, veterinarians and farm advisers have many questions about using DMS as bedding. Will it cause elevated levels of environmental pathogens that may negatively affect udder health and milk quality?

The study

Six dairies participated in the study. Some of them have used DMS for up to eight years; others have recently started.

The dairies used different DMS bedding strategies, including a dairy that used sand and two DMS strategies side-by-side. Others strategies included using fresh separated solids; digested, separated solids; and separated partially composted solids. Composting on this dairy was done in windrows and drums.

Researchers took samples of unused and used bedding over a year's time. Quality Milk Production Services (QMPS) analyzed the samples for bacterial

FYI

- Jean Bonhotal and Ellen Harrison are senior Extension associates with the Cornell Waste Management Institute and Mary Schwarz is a research assistant with the institute.
- Ed Staehr is a senior Extension associate with New York FarmNet/Farm Link
- For more information on dairy manure solids used as bedding and the study, see the CWMI website: http://cwmi.css.cornell.edu/bedding.htm
- Look for the second article on using dairy manure solids as bedding in the July issue of *Northeast DairyBusiness*. The authors will report their findings on cow-side factors.

content, and the Cornell University Johne's Laboratory analyzed them for the presence of *Mycobacterium avium paratuberculosis* (MAP), the bacteria that causes Johne's disease. Physical properties of the bedding were analyzed at Brookside Laboratories in New Knoxville, Ohio.

The study collected individual cow records on mastitis incidence, somatic cell count (SCC) and linear score (LS) for cows in the pens from which samples were taken.

Bacteria on the teat ends via teat swabs and lameness scores were analyzed at the dairy using sand and DMS. Teat-end scoring was performed at all dairies. Throughout the study, farmers, veterinarians and Cornell staff met periodically to help interpret the data and guide the investigation to answer additional questions.

Dollars and cents

Five of the dairies provided financial information to quantify costs and returns from using DMS as a bedding source. For the purposes of this study, we used only information regarding costs and returns associated with the production of DMS. We also included costs incurred prior to DMS production to accurately reflect expenses to evaluate technology that best fits each dairy's specific needs.

Changes resulting from using DMS for bedding were also factored in. When producers felt that DMS bedding resulted in a higher SCC, a value was placed on lost milk premiums to account for reduced receipts.

Machinery operating costs were determined by researching industry average costs on a per hour basis for equipment such as a skid steer, pay loader or other equipment used to produce/spread DMS. Dairies provided the number of hours they used each equipment type.

Table 1. Total costs and returns from using manure solids as bedding on five study farm

Farm	DMS sales (a)	Savings on manure hauling (b)	Savings on purchased bedding (c)	Total fixed & variable expenses (e)	Annual cost =(e-d)	Annual cost/cwt.
	(Returns (d) = a + b +c)					
B	$0	$5,490	$57,200	$51,750	- $10,940	- $0.05
C	$0	$8,450	$44,800	$22,236	- $31,014	- $0.08
D	$0	$8,325	$53,082	$59,856	- $1,552	-$0.01
E	$0	$8,425	$156,115	$87,161	-$77,378	-$0.20
F	$15,000	$50,000	$81,600	$79,257	-$67,343	-$0.26

Depreciation on structures and non-machinery equipment was calculated on each class of assets using MACRS and taking straight line depreciation on an annual basis over the life of a specific asset. Additional insurance costs were also factored in when structures associated with DMS production were built.

To determine the annual cost of implementing a DMS bedding program, all costs and returns were divided into specific areas and calculated. Expenses were divided into fixed and variable categories. We accounted for reduced expenses such as manure hauling and savings on purchased bedding, compared to conventional bedding.

Expenses were not the only area where information was quantified. One dairy generated income from the sale of DMS to other dairies. Income received plus reduced expenses minus fixed and variable expenses yielded annual savings.

All savings were quantified per hundredweight of milk sold annually. Annual savings ranged from a low of $.01 per cwt. to a high of $.26 per cwt. Average savings from the study were $.12 per cwt. ■

Dairy's carbon footprint *continued from page 23*

■ Today, about 9 million cows produce approximately 20,000 pounds of milk per lactation. The U.S. population is more than 300 million.

■ That's 2.2 times as many people with 59% fewer cows.

What does this mean for the overall amount of resources required to produce a given amount of milk? Our work shows that dairy production systems in 1944 required two- to four-times the amount of various resources and produced two- to four-times the amount of excreted nutrients and emissions compared to 2006. For example, there were approximately 4.1 times as many cows producing milk for 57% fewer consumers. And those cows required 4.5 times as much land and produced 2.6 times more methane.

This is a significant change in resource allocation for an industry and demonstrates the tremendous increase in efficiency the dairy industry has made.

The amount of CO_2 equivalents produced per pound of milk in 1944 vs. 2006 is shown in Figure 1. In 1944, the calculated CO_2 production was 10 pounds per 1 pound of milk. Compare that to 2006: The calculated CO_2 production was 3 pounds per 1 pound of milk. That is nearly a 70% decrease in the carbon footprint of milk during this time period.

How have dairy producers achieved this reduction in the carbon footprint of dairy production? Most of it relates directly to all the things that have increased milk per cow: genetics and artificial insemination, forage quality, better nutrition, grouping strategies, improved heifer rearing and use of technologies such as rbST and Rumensin. These things have increased milk per cow, resulting in more milk from fewer cows.

This is a remarkable achievement. But the dairy industry has opportunities to reduce its footprint even more. Advances in nutritional strategies will help it reduce methane production and nitrogen emissions. ■