



Department of Crop & Soil Sciences

Using Manure Solids for Dairy Barn Bedding

By Ellen Harrison, Jean Bonhotal and Mary Schwarz

For additional information see: <http://cwmi.css.cornell.edu/bedding.htm>

Dairy farms are under increasing pressure to improve their management of manure. Bedding is a very costly component of dairy farming that has significant implications for herd health as well as the environment. The cost and availability of bedding fluctuates and good consistent bedding can be hard to find and expensive. Some bedding materials (ie. straw and sawdust) result in additional nutrients being brought onto the farm, adding to nutrient management concerns. Farmers using DMS report greater cow comfort than with other bedding materials they have used. The potential financial savings are substantial and the potential to avoid bringing additional nutrients in bedding materials onto the farm is another benefit.

In the northeast, there is increasing interest in and some limited experience with the use of dried manure solids (DMS) for bedding. However there is little data on its effectiveness.

While interest is high, there is resistance on the part of some veterinarians, farm advisors, and farmers to using DMS as bedding primarily due to concerns regarding elevated levels of environmental pathogens (known to negatively affect udder health and milk quality) and moisture control. Several NYS farms have adopted this practice successfully. Other farms have tried it and dropped the practice. Research conducted on the pathogen levels in various bedding materials before and after use has demonstrated that properly managed DMS can be a viable option. The concentration of environmental pathogens in organic bedding materials (such as DMS and straw) in use in the stalls may be more dependent on regrowth than on the initial concentration in the unused bedding material. So, while initial pathogen levels in DMS may be higher than in straw or sawdust, after a day in the stalls, pathogen contents are similar. Thus the initial assumption of many people that DMS would be unsuitable needs further research.

The Cornell Waste Management Institute (CWMI), in cooperation with the Quality Milk Promotion Service (QMPS) program of the College of Veterinary Medicine, is engaged in a project to test and document the use of DMS as bedding at 6 dairy farms in New York State (NYS). With partial funding from the NYS Energy Research and Development Authority, the NY Farm Viability Institute, Cornell Cooperative Extension and the College of Agriculture and Life Sciences, research on a number of farms will help to provide needed answers.

An array of practices are used on these farms including use of DMS directly out of a separator, use of manure that has been through an anaerobic digester prior to separation, and use of separated solids that have been partially composted in windrows and in-vessel composters.



Scenario	Farm 1	Farm 2	Farm 3	Farm 4	Farm 5	Farm 6
Separated/ Bedded (1)	* 1 x/wk					* 2 x/wk
Separated/ Dried/Bed (2)			* 6 x/wk			
Separated/ Drum/Bed (3)	* 1 x/wk	* 3 x/wk				
Digester/ Sep/Bed (4)				* 3 x/wk	* 3 x/wk	
Sand	*					

Table 1: Chart of steps in production of DMS for Bedding on the participating farms. Number of times animal are rebedded.

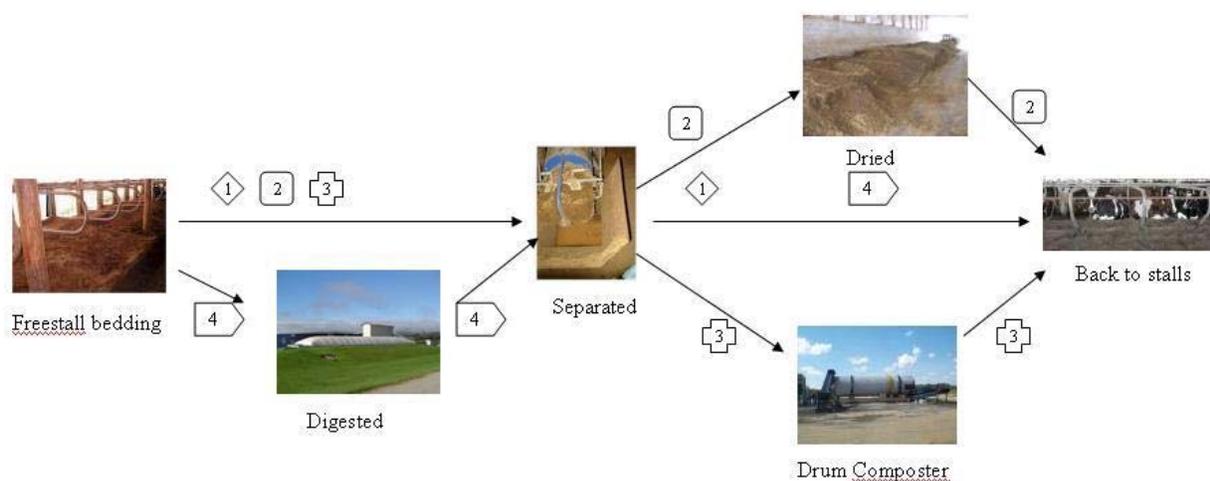


Figure 1. Manure as Bedding Scenarios – Flow Chart

To evaluate the acceptability of the various practices, data are being collected over the course of a year on the unused and used bedding materials and on herd health. On one farm, a side-by-side trial of sand bedding, bedding with DMS from a separator and separated DMS that has been partially composted (several days in a drum composter) will be run. *Johnes* (*Mycobacterium paratuberculosis*) will be tested in unused DMS bedding materials. Collaborators in the Cornell Vet School including Susan Stehman and Frank Welcome will work with the team to interpret results and provide outreach to farmers and vets. In addition, the economic, energy and environmental implications of the different practices will be evaluated and whole farm nutrient balances will be calculated by Cornell cooperators Ed Staehr, Quirine Ketterings and Caroline Rasmussen.

The primary concern regarding the use of DMS for bedding is the potential impact on the health of the herd and its relation to milk quality. The farms where this project will be conducted participate in the Dairy Herd Improvement program (DHI). Under DHI, milk samples from each lactating cow are analyzed for somatic cell counts (SCC). SCC is a measure of bacterial health. These farms also track mastitis infections. The data are computerized in a program called Dairy-Comp, making analysis for each cow or for groups of cows feasible. Hoof health is also a major farm concern and data for each cow is gathered and entered into the computer program. The farms will contribute these data to the project. These data from both before and after adoption of DMS as bedding and compared between the three treatments on the farm with side-by-side treatments will provide a means of assessing the

impact on herd health and farm economics, energy use and nutrient management of using DMS produced for bedding under various scenarios.

Sample Location and Frequency	Pathogens	Physical/Chemical Parameters
Unused bedding Monthly in summer, every other month in other seasons except monthly in all seasons on the side-by-side farm	Bacterial pathogens including: total streptococci, environmental streps, total staphylococci and S. aureus, total coliforms including E. coli, Klebsiella and enterobacter, proteus, seratia, corynebacter, molds and yeast Mycobacterium paratuberculosis	Particle size, organic matter, pH, moisture, respiration/maturity, total P, extractable P, total N, NO ₃ , and copper
Used bedding Monthly in summer, every other month in other seasons except monthly in all seasons on the side-by-side farm	Bacterial pathogens including: total streptococci, environmental streps, total staphylococci and S. aureus, total coliforms including E. coli, Klebsiella and enterobacter, proteus, seratia, corynebacter, molds and yeast	Particle size, organic matter, pH, moisture, respiration/maturity, total P, extractable P, total N, NO ₃ , and copper

Table 2. Sampling plan

The health of teat ends is an important determinant of the impact of bacteria on milk quality and cow health. While bedding is not expected to impact teat end health, teat end health may result in differences in the way bedding materials affect SCC and mastitis. We will include quarterly teat end scoring by QMPS at the farm where the side-by-side comparison will be done. This will ensure that differences in teat end health between the groups does not account for any differences we measure. We will also score teat ends twice at the other farms to help evaluate whether any observed mastitis is related to damaged teat ends rather than bacteria in the bedding. In addition, at the farm where we will do side-by-side comparisons, we will obtain teat swabs quarterly from approximately 20% of each of the three treatment groups. This will provide data about the bacteria actually on the teats to allow for comparison with bacteria in the bedding. The farms will also send samples to QMPS to identify the bacteria responsible for clinically diagnosed mastitis cases.

The results of this two-year project will be shared through open houses at the participating farms, presentations, fact sheets and articles. Students and faculty at SUNY Morrisville will have an opportunity to incorporate aspects of the project into educational activities to help assess the potential for using DMS bedding on their farm. Additional materials, including a review of relevant literature, will be posted on the CWMI WWW site (<http://cwmi.css.cornell.edu/>) as they become available.