



Ryan Ebert

# Compost barns take a cue from the weather

The temperature outside can impact a compost-bedded pack inside the barn.

by Elizabeth Eckelkamp, Joseph Taraba, Robert Harmon, and Jeffrey Bewley

COMPOST-bedded pack barns can be a great place to house dairy cows. Certain challenges come with them, though, including the availability of bedding, when to add new bedding, and how the barn environment affects the bedding and the cows.

Unlike freestalls or tie stalls, managing a compost-bedded pack does not have an easy indicator such as “the stalls look empty, time to add more bedding.” Compost barns have to be managed based on the moisture of the bedding, which positively impacts the measurable internal temperature of the pack.

The ambient air temperature and humidity play a role in how well the bedding is composted. More effective composting actually reduces the amount of bedding required through additional evaporative water loss.

How do we ensure effective composting? What role does ambient air temperature and humidity really play?

## When temperatures rise

Eight dairy producers, using compost-bedded pack barns, helped us answer these questions. The barns were monitored every other week over a year for internal temperature (8 inches into the bedded-compost pack, which is typical tillage depth); bed surface temperature; moisture content; and bedding bacterial count. We also tracked the ambient air temperature and humidity, herd cleanliness, herd somatic cell count, percent of cows with a somatic cell count (SCC) over 200,000 cells/mL, and clinical mastitis reported by the dairy producers and farm staff.

Compost barn beds were managed to maintain roughly 55 percent moisture content, with an internal temperature at or above 100°F year-round, and were tilled (stirred) at least twice a day. Some farms milking 3x tilled three times a day.

We found that compost moisture and internal temperature were not affected by milk yield, stocking density, humidity, or rain level based on management practices utilized by the dairy managers. Stocking density was 86 to 98 per-

cent (assuming 100 square feet per cow), so no overstocking occurred on these farms.

The only factor that changed compost moisture and temperature was the ambient air temperature (Figure 1). Compost internal temperature rose with elevated ambient air temperature, and compost moisture fell when ambient air temperature climbed. These observations support what dairy producers in the field experience — that compost barns are easier to manage in warm weather.

## Monitor bedding moisture

Producers also tend to need less bedding in the summer. The heat of composting (the internal temperature) and the higher outdoor temperature work together to dry the pack's surface. The drier the bed surface layers, the less bedding that is required. Some producers may be able to avoid adding bedding for three months or more during the summer.

Regardless of the ambient air temperature, at some point new bedding will be required. The best time to add is when bedding exceeds 55 percent moisture but before it reaches 60 percent.

When bedding is wet enough to stick to cows (greater than 65 percent), it is too late. The bed is in a deteriorating stage because high-moisture compost generates less heat.

A quick way to test this is using the “ball” test. Pick up a handful of bedding and squeeze it into a ball with your hand. If the ball immediately

DAIRY PRODUCERS have found that it is easier to manage a compost-bedded pack barn in warmer weather because higher outdoor temperatures and the heat of composting work together to dry the pack's surface.

falls apart when your hand opens, the moisture level is roughly below 40 percent. If you can bounce the ball on your hand and it then falls apart, it is roughly 55 percent moisture. If you bounce the ball on your hand and it falls apart in chunks, doesn't fall apart, or if water is able to be squeezed from it, it is above 60 percent moisture and is too wet. At this point, more bedding is required to reduce the moisture content of the pack and keep the cows dry.

There has been some speculation that the heat of composting might kill bacteria in the pack. However, even at the lowest bacterial numbers, 31,000 colony forming units per gram of bedding were still present. Just for reference, a level of 1,000,000 colony forming units per gram of bedding is the “threshold” above which mastitis infections are thought to occur more often.

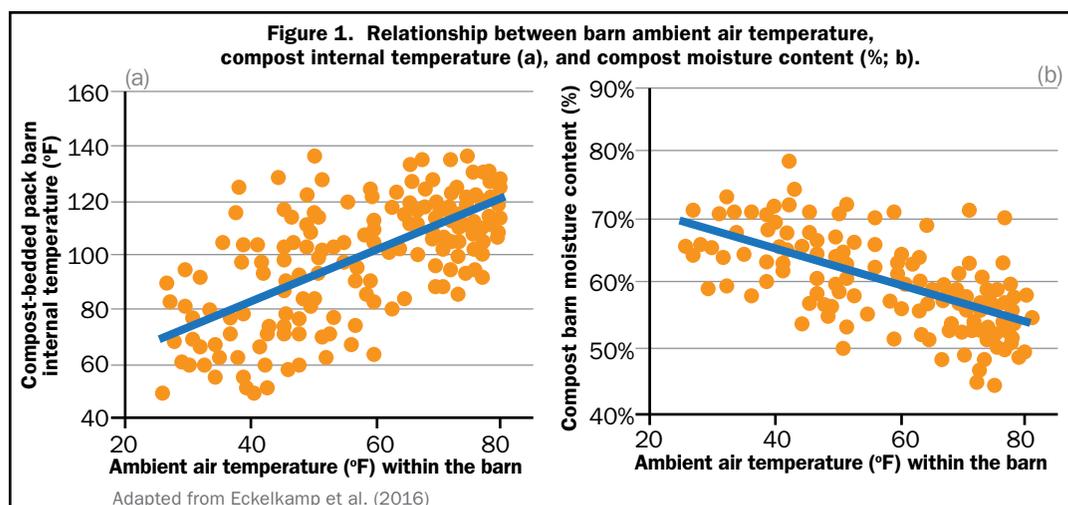
We monitored bacillus, streptococcus, staphylococcus, and coliform species numbers and their response to pack moisture and internal temperature. Although the heat of the pack didn't kill all of the bacteria, all bacteria concentrations except coliforms decreased as the internal pack temperature increased. Coliform species concentrations didn't change much regardless of the internal pack temperature.

## Cows react to the heat

Throughout the study, the average herd SCC was 251,000 cells/mL with an average bulk tank SCC of 240,000 cells/mL. Bear in mind that this was not significantly different from the seven sand-bedded freestall barns monitored during the same time period. Individual cows with high SCC (>200,000 cell/mL at test day) and herd SCC were not directly influenced by pack moisture or temperature. However, they were significantly affected by ambient air temperature, both increasing as the air temperature outside climbed.

Cow cleanliness was influenced by compost moisture and ambient air temperature as well. There were more dirty cows at a greater moisture level and more clean cows at a greater ambient air temperature. This relationship played into the overall subclinical mastitis prevalence. As compost moisture and ambient air temperature rose, the number of cows with SCC greater than 200,000 cells/mL on test day also grew. Likely, more bedding sticking to the cows at greater moisture coupled with the high ambient air temperature were the cause of the elevated SCC.

Managing for seasonal weather conditions is critical. If you live in a colder region, you are going to need to use more bedding than someone in a warmer area. Your barn needs to be composting effectively (high internal temperature greater than 100°F) before cold weather hits to keep moisture low and reduce the amount of bedding needed over the winter. 🐄



Eckelkamp is a Ph.D. student, and Taraba, Harmon, and Bewley are professors at the University of Kentucky.