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CENTER FOR INTEGRATED AGRICULTURAL SYSTEMS/UW-MADISON COLLEGE OF AGRICULTURAL AND LIFE SCIENCES

# Research Brief

## #28 Outwintering dairy cattle: manure management issues

The sparkling, frozen world of Wisconsin in winter presents several challenges to its dairy farmers. One of these challenges is how to manage dairy cattle wastes so that nutrients and organic matter are added to fields and pastures instead of streams and water sources.

Ed Brick, a civil and environmental engineer, has completed the first year of a two-year CIAS study of outwintering cattle. He visited 33 managment intensive rotational grazing dairy farms throughout Wisconsin during the winter of 1996-97 to observe and interview farmers about a variety of aspects of outwintering.

The destination of nutrients, organic matter, and biological components of manure and urine in an outwintering situation is the focus of this research update. (For a discussion of outwintering and animal health, see *Research Brief* #27, "Outwintering dairy cattle: animal health issues.")

### Approaches and nutrient capture

Seventeen of the farmers Brick visited kept their milk cows on a cement yard during the winter, like a confinement dairy. Many of them, however, did outwinter heifers or young stock. Sixteen of the farms outwintered their milk cows. Brick found three basic management approaches to outwintering: rotation through paddocks, sacrifice paddocks, and bedded packs. Some farms used a combination of these. (See Figure 1.) Each approach has a different impact on waste handling and nutrient capture.

❖ **Rotating cattle through pastures** distributes urine and manure throughout the pastures in winter as well as summer. In winter, farmers rotated cattle, hay, and round bale feeders throughout paddocks. Brick says that many of nutrients in urine evaporate or soak into the ground. But urine may enter the soil during winter if the ground has lattice frost. With lattice frost, air pockets between soil particles are only partially filled with ice, leaving spaces for liquids to seep in. In spring, thawed urine will either move as runoff or seep into the soil.

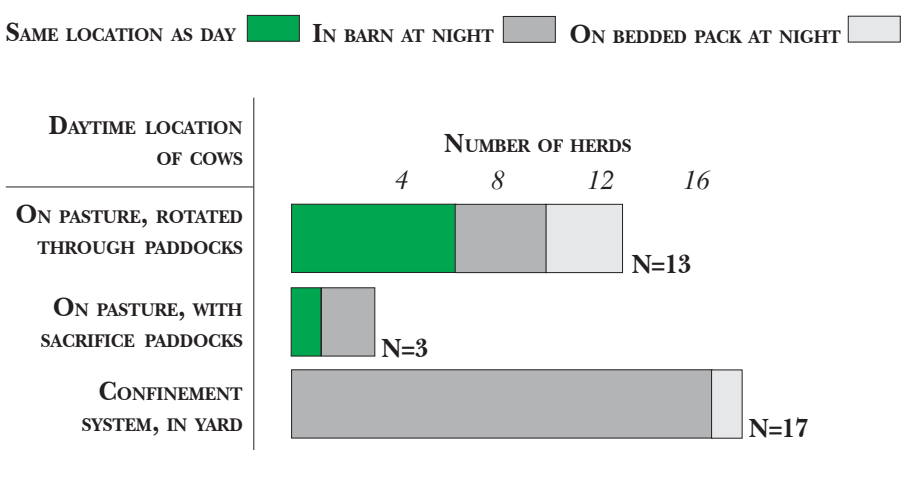
Studies have shown that manure retains some nutrients after its surface has hardened. The organic matter of manure dropped in winter remains intact until spring. On the farms using winter paddock rotation, Brick observed that manure tended not to move horizontally across the pastures as runoff, because it was anchored by vegetation. Manure decomposed in place in the pasture, cycling nutrients into the pasture system.

❖ Some farmers keep their cows outside in one pasture all winter, called a **sacrifice paddock**. Compaction, pugging (tearing up of the soil), and puddling occurred in sacrifice paddocks that did not have a frozen soil surface. In these situations, Brick saw that the ground becomes so compacted that little infiltration of manure and urine nutrients into the soil was possible. As Brick describes it, "manure and urine build up in a 'muddy soup' that stays in place on flat ground." Spring renovation of sacrifice paddocks, consisting of dragging, seeding, and sometimes scraping, corrected the waste buildup and compaction problems.

For example, Brick reports that one farmer kept 120 heifers and dry cows on a 20-acre pasture, with two haylage heaps providing feed. The ground around the heaps was torn up and had accumulated a lot of manure. In spring, the

FIGURE 1

**Winter location of milk cows in study, daytime/nighttime**



farmer scraped the manure and disturbed soil off the paddock, spread it on his pastures, and reseeded the disturbed area.

The manure buildup and hoof action on the soil of the sacrifice paddock can be used to advantage. Some farmers place sacrifice paddocks strategically in areas where an undesirable plant grows or where they plan to reseed the pasture or cultivate for a crop.

One farmer in the study used a mounded version of the sacrifice paddock. The rapid surface runoff afforded by the mound prevented the muddy situation of flat sacrifice paddocks, while wastes were directed into a manure lagoon.

❖ Farmers put cows on **bedded packs** of hay, stalks, or sawdust, under a roof at night. The manure and urine deposited on the bedded packs soaked into the bedding, where microbes began the decomposition process. Nutrients from these wastes bonded with the carbon in the bedding material, to be later spread as a field amendment in the spring.

Frequent turning and aeration of the bedding would have resulted in a nutrient rich compost, but only one of the farms turned and composted the bedding to any degree. "Graziers tend to have a philosophy of minimizing labor and equipment, and the requirements of fully composted bedding compromise that philosophy," says Brick. He adds that very few conventional farmers compost the bedding that accumulates over winter.

## Manure and streams

On two of the farms Brick studied, cows had access to a stream as their water source. At another farm, the cows had access to a spring and the stream flowing from it. He observed deposition of manure and urine on stream ice as the animals walked over it to an open hole for a drink. Although the manure and urine may have aged to some degree before the ice thawed, organic matter and possibly nutrients and biologically active components would enter the stream in the spring.

Brick suggests that "temporary electric fence should be installed to make cow access to the stream smaller—perhaps only allowing access to one cow at a time." This would significantly decrease the amount of waste deposited on the stream. He also recommends that in order to reduce the risk of cows falling on the ice, farmers should create a stepped approach to streams with steep banks.

Cows watered at a spring deposited manure and urine around it and the stream flowing from it. The only water movement that would push wastes toward the stream is snow melt and rainfall. "The visibility of manure deposits in the riparian (stream bank) zone is a theme of much remark," says Brick.

But does it pose a large threat to water quality? Brick references a study in which manure pats were rained on by a sprinkling infiltrometer. That study recorded little movement of solids or nutrients from the manure pats. Brick says very little waste would move into the stream under those circumstances.

"The Manitowoc County conservationist, in conjunction with officials in eastern Wisconsin, completed a study which showed that runoff of nitrogen and phosphorus from conventional tillage is significantly greater than runoff in a grazing situation," comments Brick. He notes that additional research is needed in this area.

## Conclusions

The wastes produced by outwintered animals can be controlled and managed to enhance pasture fertility and stay out of the water cycle. Just as in other aspects of successful outwintering, management and planning ahead are the keys.

In fact, Brick says, "Manure deposited in bedded packs or distributed throughout paddocks probably has a lesser chance of entering a stream as runoff than nutrients from conventional tillage." His observations and interviews show that outwintering dairy cattle does in fact have promise for an environmentally sound method of winter waste control.

## ❖ Some Internet outwintering information sources

An ongoing farmer-to-farmer discussion of outwintering has appeared on the Internet list server GRAZE-L throughout 1997. Find these archived e-mail postings at the GRAZE-L World Wide Web searchable archives at:

**http://grazel.taranaki.ac.nz/grazelsearch.html**

Type "outwintering" in the search engine box for a list of messages on this topic. (Use this tool to search for other grazing-related topics, too.) GRAZE-L's home page is at: **http://grazel.taranaki.ac.nz/**

Ohio grazier F.W. Owen has outwintering resources at his Web site at: **http://www.bright.net/~fwo/seasonal/S001.html**

CIAS has short grazing-related research updates, including outwintering, at: **http://www.wisc.edu/cias/gds-1.html**

If you don't have access to the World Wide Web, contact your county Extension office, local library or school, or someone else with WWW access to get this information for you.

*The Center for Integrated Agricultural Systems (CIAS) brings together university faculty, farmers, policy makers, and others to study relationships between farming practices, farm profitability, the environment, and rural vitality. Located at the University of Wisconsin-Madison, it fosters multidisciplinary inquiry and supports a range of research, curriculum development, and program development projects. For more information on the center or on the research in this brief, contact:*

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