

The Scoop

On Animal Agriculture and the Environment

OPEN HOUSE FEATURES RESEARCH, FOOD AND FUN

by Wendy Powers



Wendy Powers is director of environmental stewardship for animal agriculture at MSU. You can reach her at wpowers@msu.edu.

There is nothing a scientist loves more than showing off his or her research—especially when it includes a state-of-the-art lab that addresses prominent issues for Michigan livestock producers.

That's why the MSU Extension Animal Agriculture and

Environment team and the Water team have partnered with several MSU scientists to host a homecoming open house Oct. 13 from 1 to 4 p.m. You'll get a chance to see several research projects at the MSU Dairy Cattle Research and Teaching Center and get a first-hand look at the new Animal Air Quality Research Facility.

The facility was designed and constructed to allow us to study ways to reduce air emissions from animals – specifically, looking at how we feed animals and how that affects gases that are naturally emitted. Our first study will be focused on emissions from dairy cow facilities. Open house visitors will have the opportunity to see dairy cows housed in the laboratory and observe real-time emission data.

At the MSU Dairy Cattle Research and Teaching Center, visitors can also learn about storm water runoff control using intensive management treatment and an innovative method using biological and physical treat-

ment strategies for milking parlor washwater. In addition, graduate students will showcase more than a dozen research projects specific to environmental quality and animal agriculture.

Ben Darling, assistant director of the MSU Office of Land Management, will give visitors an in-depth look at the comprehensive nutrient management plan (CNMP) that he helped complete for the MSU farms. (Learn more on the next page.)

Bring your family and make a day of it by also attending the College of Agriculture and Natural Resources tailgate party and the MSU Homecoming football game against the University of Indiana Hoosiers.

No reservations are required for the open house. For information about the CANR tailgate party, contact Kathryn Reed at kreed@msu.edu or (517) 355-0284. If you respond early, she may also be able to help you get game tickets.

I hope to see you there!

Things to do on October 13

- 1-4 p.m. Open house**
MSU dairy farm and Animal Air Quality Research Facility
- 5-7 p.m. CANR tailgate**
Demonstration Hall
Practice Field
- 7 p.m. Indiana Hoosiers vs. MSU Spartans football game**
Spartan Stadium

The Scoop is produced every other month by the MSU Extension Animal Agriculture and the Environment Team.

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Learn more about MSUE's focus on animal agriculture and the environment at www.animalagteam.msu.edu.

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MICHIGAN STATE
UNIVERSITY
EXTENSION

Welcome to the first issue of *The Scoop*, a semi-monthly newsletter designed to keep you informed about the exciting new changes in animal agriculture as it relates to the environment. Every other month you'll get a healthy dose of timely information you can use on your farm, in your job or around the countryside. All this and more, brought to you by the MSU Extension Animal Agriculture and the Environment Team.

ARE CNMPS WORTH THE HASSLE?

The man who helped do it for the MSU south campus farms answers with a resounding Yes!

by Ben Darling

When we entered into the Michigan Department of Environmental Quality (DEQ) national pollutant discharge elimination system (NPDES) permit process for the MSU south campus farms, we went through the same emotions and struggles as everyone else when contemplating the task at hand. These were:

1. **Anger** – “They want us to do what?!”
2. **Denial** – “We don’t have any problems and are already doing things right!”
3. **Blame** – “It’s not us, it’s them!”
4. **Overwhelmed** – “How are we going to do this and where do we start?!”
5. **Stingy** – “That’s going to cost how much?!”
6. **Realistic** – “Step back and take a look with fresh eyes.”
7. **Determined** – “Let’s use what we know, the resources we have and what we are learning, and put it to work.”
8. **Willing** – “We’ll seek assistance when needed.”
9. **Satisfaction** – “Finally done (for now), and it is actually very useful.”

The first key to our progress was to reach No. 6—realistic—as quickly as possible. Once we were able to accept the fact that we were not doing everything wrong and we were not doing everything right, but that we needed to look at our system with fresh eyes and find ways to do everything better, we were off and running.

As we worked our way through the development of our comprehensive nutrient management plan (CNMP), we employed a strategy to look at each of our livestock farms independently and intensely. We scrutinized everything from management, operation and housekeeping to location, layout, design and future planning, maintenance, inspection and record keeping, and how each individual farm fits into the south campus farms system. As we scrutinized our facilities and peeled back the layers to look at individual practices and operations, we realized that we needed specific expertise and assistance to better understand and evaluate a number of issues and the options available. We looked to MSU Extension staff members to provide that expertise and assistance. They stepped up to the plate without hesitation.

While reviewing all of the facilities, we also looked at the management of our land base. Although we had maintained an elaborate field management system for many years and have that historical knowledge base in the memory banks, we found we could incorporate newer technologies that would enhance our system capabilities. We began incorporating GPS locating and GIS mapping into our overall system, and we used manure management planning software to officially plan/schedule our manure applications. We also utilized GIS mapping to identify the locations of field tile, sensitive areas and field setbacks. Incorporating these technologies gave us the opportunity to train our employees better, track our activities more consistently and operate within a coordinated system.

In addition to enhancing our land management system, the CNMP development process led to a number of positive changes across the south campus farms, including:

- Additional conservation practices.
- Roofs over cattle pens to divert clean water.
- A manure storage building to provide containment and divert clean water.
- Installation of wastewater treatment strips for process water (research project).
- Feed storage and management changes—envelope bagging, compaction, harvest conditions, housekeeping.
- Manure nutrient export—composting, burning for energy, sale.
- Intensive pasture management.
- Anaerobic digester possibilities.

So, was it worth it? Definitely! And it goes beyond just having the completed CNMP in hand. The CNMP development process led to significant improvements in the overall farm system and its operation. We now refer to our CNMP on almost a daily basis. It compiles not only all the who, what, when, where and why about the livestock farm system but also all the facility and field aerals and facility infrastructure information in one 1-inch spiral-bound document. Sweet!

Darling is the assistant director of the MSU Office of Land Management. You can reach him at darlin21@msu.edu.

TIME TO COMPLY

These tips can help you plan and record your intentions through the permit process

by Natalie Rector

Some say laws exist to protect our rights. Others feel they only restrict us. Regardless of your viewpoint, laws continue to be a part of our lives.

As of July, owners of large confined animal feeding operations (CAFOs) in Michigan were to apply for the National Pollution Discharge Elimination System (NPDES) permit through the Michigan Department of Environmental Quality (MDEQ). According to the MDEQ, most farmers in that category either applied for the permit or notified the MDEQ that they no longer operate large CAFOs or had no potential to discharge.

In mid-July, the Environmental Protection Agency (EPA) extended the deadline for newly defined CAFOs seeking NPDES permit coverage and for permitted CAFOs to develop and implement nutrient management plans (NMPs) to February 27, 2009.

The deadline extensions are necessary to allow the EPA time to respond adequately to an array of public comments on issues raised by the Second Circuit Court's decision that the Clean Water Act does not authorize the EPA to regulate all CAFOs before certain compliance dates take effect. The February 27, 2009, deadline will provide additional time, after the final rule is promulgated, to allow states, the regulated community and other stakeholders the opportunity to adjust to the new regulatory requirements.

Michigan, however, has its own dates already in state rules, which supersede the federal deadlines. (States have the right to require stricter standard for any industry, as long as they use the federal law as their baseline.)

Large CAFOs in Michigan must follow the MDEQ NPDES general permit (number MIGO19000) from January 1, 2008, to April 1, 2010. These farms are entering this permit in the middle of its five-year cycle. Six farms are seeking individual permits, which will last five years. In addition, a few medium and small AFOs are under a permit because of environmental violations.

Know your permit

Read your permit carefully and completely. Sort the information that pertains to your operation and study it. The general permit was written for all livestock species, so some items might not apply to your operation. Others may have a dramatic impact.

Next, put a strategy in place that will work on your farm by seeking consultants and other resources, such as sample record-keeping forms available at www.animalagteam.msu.edu.

If you have questions about permit requirements, call your MDEQ district office. MDEQ staff members would much rather answer questions about compliance up front than have to take enforcement action later.

The process

Producers seeking an individual permit will receive a draft permit. If necessary, they may work with the MDEQ to make revisions. Once revisions are approved, producers must complete a CNMP within a certain period of time (which will be outlined in the permit).

Applicants who agreed to comply with the general permit will receive a draft certificate of coverage (COC). That, too, will include a timeline for CNMP completion. Once the COC is ready, there may be a public notice period. (Individual permits are automatically subject to a 30-day public notice period.)

COCs for new CAFOs, CAFOs that were not MAEAP-verified or CAFOs that are currently permitted are posted on the MDEQ Web site for two weeks. COCs for CAFOs that are MAEAP-verified or have current permit coverage will be publicly posted on the MDEQ Web site in late summer/early fall 2007. After public notice, the permit or COC can be issued.

Complying with the permit

You must comply with permit requirements as soon as the permit is issued. The permit's timeline will include time to develop or revise a CNMP. It will also allow evaluation time and, if necessary, time to upgrade storage structures, time to build six months of manure storage and time to choose a certified operator. Other issues may be negotiated in an individual permit. Other permit requirements—such as collection of wastewater, inspections, record keeping and land application requirements—must be implemented when the permit is issued.

Developing a CNMP

Many farmers work with a consultant to develop or modify their CNMPs.

Michigan producers have typically included several items in their CNMPs that are not required under the current permit. NPDES permits are for water protection (mostly surface water). Therefore, such items as odor management, feed management, emergency plans, vet waste, employee training, whole-farm budgeting, and prescriptive field assessment tools (such as RUSLE 2), wind erosion calculations and other non-water-related items, do not need to be included. These issues are obviously

important and producers should keep them in their management system, but the MDEQ does not require them. One approach might be to continue the management practices but choose not to provide this documentation to the MDEQ. Remember, anything on file with the MDEQ is public record.

The issues that the MDEQ is focused on include an annual reporting requirement, six months of manure storage, diversion of clean water, not disposing of pesticides in manure storage, checking and recording weather forecasts before spreading and noting actual weather 24 hours before and after land application, release or discharge reporting with monitoring requirements and specific land application requirements.

Storage

The permit's focus on manure storage includes the physical design, construction and management. Management includes weekly inspections of storage volumes and of the structure's integrity and the operation and maintenance of all aspects of the storage, including pumps, piping and valves. Keep records of all inspections.

If the previous evaluation of existing components was not conducted by a professional engineer (PE), producers may be asked to have this done by a PE. This requirement is new in the current MDEQ permit. PEs should work with the MDEQ to be sure they meet MDEQ criteria. Previous evaluations of existing components were limited in scope and may not meet permit requirements. Other issues may arise if storages were evaluated when they were full of manure because this limits the inspection process.

The volume design needs to show that six months' storage capacity is available, and between Nov. 1 and Dec. 31 each year, farmers must record that fact. This storage capacity must account for freeboard, a 25/24 storm event, and any runoff or additional water.

The MDEQ also needs to know your procedure for inspection, operation and maintenance. The procedural description doesn't have to be long but must be specific to your manure storage system(s). You may want to include language about how they will be inspected and what they will be inspected for—weekly visual inspections for cracks, leaks, seepage, overflow and structural integrity, for example.

Operation and maintenance will be a written procedure specific to the storage. The procedure for earthen systems may include mowing, checking the integrity of the banks and checking inflow pipes, as well as mechanical maintenance of pipes, pumps, concrete structures and clean water diversions. You must also keep records of inspections, operation and maintenance.

Land application

Another major portion of the CNMP is land application. Some specific aspects from the permit are:

- Field-by-field assessment (includes form, source, amount, timing, rate and method of large CAFO waste application).
- Testing production area waste and soils at land application sites (test manure annually and test soil every three years).
- Field inspections prior to and following land application (inspect fields within 48 hours before manure applications and 24 hours afterward, looking for tile outlet discharges, soil cracking, soil moisture-holding capacity). And inspecting again if 1/2 inch of rain falls within 30 days after application.
- Daily inspection of land application equipment when it's in use.
- Field-specific application rates for manure (following the phosphorus soil test thresholds and never overapplying nitrogen, and utilizing the winter spreading technical standard).
- Appropriate prohibitions for land applications to wet soils and/or for winter applications, and for applications when the impending weather forecast calls for precipitation.
- Methods of application (inject or incorporate within 24 hours, and observe a 100-foot spreading setback or maintain a 35-foot vegetative buffer, with all types of application, from surface waters and sensitive areas).

Remember to keep records of all of the above, read your permit and ask the MDEQ if you have any questions.

Once you're into the permit process, annual updates are due each April 1, including records or reports from the past 12 months (January-December) and an estimated projection of land application for the upcoming 12 months.

Records

Because records are such a large part of permit compliance, MSU Extension has developed sample forms that help sort the permit by creating column headings, following the permit language and helping producers determine which records should be kept. The forms also attempt to make the process easier by creating check boxes showing that the inspection or process was completed and noted. Visit www.amimalagteam.msu.edu to download the forms. They are also categorized by what records are kept on the farm and what is submitted in the annual report. The MDEQ Web site also has some examples for the manifest and manure storage criteria.

Remember, there is no substitute for reading the permit! Read it, study it and ask questions about things you don't understand.

Rector is an MSU Extension nutrient management educator. You can reach her at rector@msu.edu.

IT ALL COMES OUT IN THE WASH (WATER)

All dairies generate milkhouse wash water. The key is to make the most of it by getting rid of it using environmentally friendly methods.

by Dann Bolinger

Daily cleaning of milking equipment and facilities is not only important to a safe and healthy milk supply—it's also mandated by law. Managing the wastewater produced by this tenacious cleaning process in an environmentally responsible manner poses a challenge for many dairy farms—especially small ones.

Milking center wastewater consists of a combination of milk residue, food-grade cleansers, manure residue and water. Its production is an unavoidable daily consequence of milking dairy cows under any farm management system. At greater than 98 percent water, one might think that this effluent is not a significant environmental threat. Although low in nutrient content, the combination of the volume of the wastewater generated and its potential to reduce oxygen levels in surface waters make it a primary concern.

Even the smallest dairy farm will generate several hundred to more than 1,000 gallons of wastewater each day. A 100- to 200-cow dairy farm will produce as much as 1,000 gallons per day. The milk and manure residues result in fairly high biological oxygen demand (BOD). This means that the wastewater's natural degradation requires significant amounts of oxygen. If this occurs in a waterway, it consumes oxygen that might be needed for aquatic life.

The most obvious option for managing milking center wastewater is simply to put it into a properly designed storage pond or tank. Like manure, it can then be applied to cropland at appropriate rates. This is how it is managed on nearly all larger dairy farms. Small farms, on the other hand, are less likely to have a liquid-handling system. Constructing an engineered storage structure is expensive. The capital investment and maintenance of liquid manure-handling equipment represents yet another major obstacle. So what is a small dairy farm to do if a liquid storage for milking center wastewater is neither financially nor practically feasible?

Currently, no other practices for managing milking center wastewater are endorsed by Michigan regulatory agencies. Attempts to utilize household septic system designs for milking center wastewater disposal tend to fail because milk fat clogs conventional drainfields. Research is in progress in Michigan to find low-cost alternatives for small dairy farms, but usable results won't be available for quite some time.

This conundrum is not unique to Michigan. University of Minnesota research has identified three potentially viable low-cost options. These systems are generally practical for managing approximately 1,000 gallons of wastewater per day. Each system has the same pretreatment component—concrete tanks for settling solids and trapping fats. The effluent then advances to one of three treatment and disposal options; daily spray irrigation, a bark bed or an aerobic treatment unit in conjunction with a subsurface infiltration field.

Daily irrigation of the wastewater involves year-round daily application to a vegetated area. The wastewater is naturally treated in the soil, and the nutrients are utilized by a crop of grass or some other desirable plant. The spray field requires agronomic management, including routine harvesting of the crop. During the winter months, non-freezing spray nozzles and back-draining lines are an important part of this system. Daily irrigation may be a viable option where the risk of potential runoff from the spray field reaching surface waters is low and odor is not a primary concern.

Bark beds consist of a topsoil infiltration area under the cover of chipped or shredded wood. Primary treatment of the wastewater occurs within the topsoil. The bark covering enhances evaporation of the water and provides a carbon source for additional, though limited, biological treatment. The cover has the added advantages of filtering odors and insulating the area from freezing.

Aerobic treatment units are not as cost-effective as the other two options investigated at the University of Minnesota, but they may still be viable for some farms. These systems treat the wastewater by encouraging aerobic bacteria to break down the nutrients in the wastewater. The partially digested effluent is then released into a subsurface infiltration area.

These options offer promise for small dairy farms to cost-effectively eliminate the risk of milking center wastewater to surface waters. Every dairy farm is unique. Each farm's immediate plans, long-term goals and level of risk must be considered when determining the best approach to managing wastewater. For more information about options best suited for your farm, contact your regional MSU Extension dairy educator.

Dann Bolinger is a former dairy educator. He left MSUE in August for a job in the industry. We will miss his valuable insight.

IN THE WORKS ...

Looking to the future is one of the main goals of the Animal Agriculture and Environment Team at MSU. The following projects are in the works. Look for future issues of this newsletter for updates.

Project: Conference on Balancing Animal Agriculture and Communities

Primary investigators: Wendy Powers, director of environmental stewardship for animal agriculture, and Dale Rozeboom, animal science associate professor

Funding partners: MSU Extension, Animal Agriculture Initiative

The impact of animal agriculture on the environment and people is a controversial topic in Michigan communities. Because of the importance of animals to the state's economy, issues related to new, expanding and existing animal enterprises must be addressed in a manner that considers all viewpoints.

Balancing Animal Agriculture and Communities is a one-day conference that brings together farmers, elected and appointed officials, government employees and interested community members to share information about this important topic and help MSU shape future projects that address the challenges that many communities face.

The conference will take place February 29 at the MSU Kellogg Conference Center. Look for more information in the November issue of this newsletter, or log on to www.animalagteam.msu.edu.

Project: Reducing methane emissions with coconut oil feed supplements

Primary investigators: David Beede, Meadows chair in dairy nutrition and management; Wendy Powers, director of environmental stewardship for animal agriculture; Marcus Hollmann, animal science doctoral student

Funding partners: C.E. Meadows Endowment, Animal Agriculture Initiative and U.S. Department of Agriculture

Methane emissions are one of the greatest contributors to the greenhouse effect, and lactating dairy cows produce the most methane of all livestock species. Collectively, ruminants' digestive tracts plus stored manure generate about 25 percent of total methane emissions and 80 percent of total ammonia emissions. Hollmann's research, under the direction of Powers and Beede, will focus on reducing methane and ammonia emissions from the cows' rumens and hindgut and from stored manure. Studies have shown the medium-chain fatty acids like the ones found in coconut oil can reduce ruminal methane production by 68 percent. Hollmann will mix coconut oil into feed and measure its effects on methane emissions from lactating dairy cows at the new Animal Air Quality Research Facilities on the MSU campus. MSU is the first research institution in the United States to study coconut oil's effect on gas emissions from lactating dairy cows.

Project: Educating crop advisors about the economic, agronomic and environmental benefits of manure nutrient management

Primary investigator: Natalie Rector, MSUE nutrient management educator

Funding partner: MSU Extension

Many livestock producers rely on local fertilizer dealers for their crop consulting needs. Often, consultants are not comfortable making recommendations regarding manure nutrients. However, high fertilizer prices make it critical for farmers and consultants to understand the benefit of using animal manure to fertilizer cropland.

This three-state coordinated training program on manure nutrients will help teach consultants and non-livestock farmers how to get the most from recycled manure nutrients while protecting water quality and saving money.