Managing Pain to Increase Cow Comfort

Efforts to improve cow comfort are aimed at increasing milk production and animal longevity. Many cow comfort initiatives focus on environmental aspects of cow comfort, but there are pain management techniques that can alleviate animal discomfort, as well.

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The idea that dairy cattle housed in well-designed and comfortable environments produce more milk and have longer, healthier, and more productive lives has been well supported by formal research studies as well as by the personal observations of experienced dairy personnel (1,2). Known as cow comfort, this concept includes a wide range of issues and measures aimed at improving animals’ welfare and dairy businesses (3).

Environment
As indicated in the diagram below, the primary focus of many comfort-enhancing efforts is improvements to the animals’ environment.

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Improving a cow’s environment is often the first step towards avoiding future problems that cause painful conditions. For example, decreasing the time cattle spend in a holding pen or using rubber mats to cushion pens or walkways may decrease the incidence of lameness. However, even the most comfortable environment will not directly provide relief for an animal or group of animals experiencing the potentially painful conditions listed below.

PAIN-INDUCING CONDITIONS

Infections
- Mastitis
- Metritis
- Diarrhea
- Pneumonia
- Foot rot

Surgical Procedures
- Dehorning
- Castration
- Tail docking
- C-section
- Laceration repair

Other
- Post-calving
- Fractures
- Dislocations
- Strain
- Sprains

Farm Manager Bob Kreft uses a balling gun to administer aspirin bolus to a cow at the Michigan State University Dairy Cattle Teaching and Research Center. Aspirin is one of several drugs that can be used to relieve pain and increase cow comfort.

Photo by Jacob McCarthy

Drugs to Alleviate Pain

Pain management often includes the use of therapeutic agents specifically designed for that purpose. The list below is a representation of drugs commonly used by dairy practitioners.

PAIN-MANAGEMENT DRUGS

Anesthetics
- Lidocaine
- Carbocaine
- Mepivacaine
- Xylazine
- Detomidine

Non-steroidal anti-inflammatory
- Flunixin meglumine
- Carprofen
- Ketoprofen

Sedatives
- Acepromazine
- Xylazine
- Detomidine

Anesthetic agents, such as lidocaine, are used to prevent the pain associated with surgical incisions for procedures such as correction of displaced abomasum, caesarean sections and umbilical hernia repair. They have long been a part of a standard of care that veterinarians provide as routine pre-operative surgical preparation of the patient. However, use of this or a similar agent for some other commonly performed procedures is not standard practice. A recent report, “Use of analgesia in cattle by Ontario veterinarians,” which focused on lameness and animal welfare, determined that although many veterinarians recognized that their treatments for certain lame-
ness-related conditions were painful, many did not administer analgesics to decrease the pain in the cattle undergoing treatment. This same article reported that following presentations and discussions on pain management, many veterinarians indicated that they planned to increase their use of analgesics in their future pain management protocols (4).

Another example of pain management is the use of non-steroidal anti-inflammatory drugs (NSAIDs) such as aspirin or Banamine® for control of post-operative pain. Although documented evidence that this practice should be a standard of care has not as yet been established, a growing body of research supports the administration of pain medication before a painful event, such as surgery, is encountered. Optimally, pain medication should be administered at least 30 minutes before an incision is made to decrease pain associated with surgical procedures. When preparing an animal for surgery, a dose of Banamine administered by intravenous injection will rapidly provide pain control, and decrease post-operative discomfort.

Conclusion

Although the body of knowledge about pain management is much greater than presented here, the important message to dairy managers and veterinarians alike is to consider expanding your appreciation for cow comfort to include not only environmental comfort, but also protocols that can ease or possibly alleviate pain in our hard working dairy cattle. This approach will add slightly to the cost of overall treatment, however, it will be well worth it.

Notes

Most of the drugs listed, although not approved for use in food-producing animals, are available for use in an extra-label manner by veterinarians following the Federal Animal Medicinal Drug Use Clarification Act. It is important to use them in a way that is consistent with identified indications, contraindications, dosages, routes of administration, and withdrawal times for milk and meat.

References


Maximizing Your Manure Investment

Manure can be as effective at supplying nutrients as fertilizers, but its variability means producers need to put some thought into what, where, when, and especially, how manure is applied. The examples provided here are from swine operations, but the factors involved apply to dairy farms, as well.

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Land application of manure is costly, but can be financially worthwhile. This article provides an example of a hog finishing operation with manure utilized in three different scenarios with and without direct incorporation into the soil. The value of the nutrients supplied for crop production ranges from $20 to $105 per acre. There is no such thing as a "typical" manure sample, so laboratory analysis should be done. In the examples, analysis shows that this hog manure provides 50 pounds of total nitrogen (N), 20 pounds of phosphorus (P), and 22 pounds of potassium (K) per 1,000 gallons. Of the total 50 lb of N, assume 41 lb are available when incorporated, but only 5 lb are available when surface-applied under hot-dry conditions. What makes the value of the captured nutrients so variable?

Example 1

In example 1, the manure will be injected ahead of corn; the N will be fully credited, and the soil test was low in P and K. Therefore, all of the N, P, and K value in the manure is realized. These values could be used with a neighboring crop farmer who probably has some corn fields requiring P and K. These values also could be typical for a livestock producer who has lower soil tests on fields that are considered too far and too costly to haul manure to.

More than 85% of the dollar value of the N is lost when manure is not incorporated. It becomes apparent that to fully value manure nutrients, the N needs to be managed either by mechanical incorporation or by relying on cooler temperatures and precipitation to retain the N. Of course, there will be a cost associated with injection or incorporation.

Example 2

In example 2 (page 5), the soil tests are high enough that no P or K would have been recommended. Therefore, only the removal values of these nutrients and all of the nitrogen are credited. In a corn/soybean rotation where manure is targeted ahead of the corn crop and no manure is applied during the soybean season, the manure values for P and K will average below crop removal over the life of the rotation.

Example 3

In example 3, the manure was put on ground going to soybeans. Even though soybeans have a very high need for nitrogen, they capture it from the atmosphere when not supplied by fertilizer or manure. They will utilize manure nitrogen if it is applied, but a farmer would not normally purchase

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**Example 1. Value of 4,000 gal/acre of swine manure applied ahead of 140-bu/acre corn, when the soil test calls for P\textsubscript{2}O\textsubscript{5} and K\textsubscript{2}O.**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Supplied by 4,000 gal/acre manure (lb)</th>
<th>Recommended crop yield potential (lb)</th>
<th>lb value/acre inject(no incorp)\textsuperscript{1}</th>
<th>$/lb</th>
<th>Value/acre incorporated in spring</th>
<th>Value/acre surface-applied, not incorporated</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (available)</td>
<td>164</td>
<td>160</td>
<td>164(20)\textsuperscript{2}</td>
<td>0.40</td>
<td>$65.60</td>
<td>$8.00</td>
</tr>
<tr>
<td>P\textsubscript{2}O\textsubscript{5}</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>0.29</td>
<td>23.20</td>
<td>23.20</td>
</tr>
<tr>
<td>K\textsubscript{2}O</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>0.19</td>
<td>16.72</td>
<td>16.72</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$105.52</td>
<td>$47.92</td>
</tr>
</tbody>
</table>

\textsuperscript{1} If manure is surface applied and incorporated at 0-1 days, 30% of volatile N is lost. If incorporation does not occur or occurs at greater than 7 days after surface application, all volatile N is lost.

\textsuperscript{2} 164 lb/acre with injection or 20 lb with no incorporation.
Example 3. Value of 4,000 gal/acre of swine manure applied ahead of soybeans, 40-bu. yield, assuming beans need zero nitrogen and utilize removal values of $P_2O_5$ and $K_2O$.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Supplied by 4,000 gal/acre manure (lb)</th>
<th>Recommended crop yield potential (lb)</th>
<th>lb value/acre</th>
<th>$/lb</th>
<th>Value/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (available)</td>
<td>164</td>
<td>160</td>
<td>0$^1$</td>
<td>0.40</td>
<td>$0^2$</td>
</tr>
<tr>
<td>$P_2O_5$</td>
<td>80</td>
<td>52 (removal)</td>
<td>52</td>
<td>0.29</td>
<td>$15.08</td>
</tr>
<tr>
<td>$K_2O$</td>
<td>88</td>
<td>38 (removal)</td>
<td>38</td>
<td>0.19</td>
<td>$7.22</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$19.92</td>
</tr>
</tbody>
</table>

$^1$ Soybeans fix atmospheric nitrogen if not supplied by manure. There is no value assigned to the nitrogen in manure because the producer would not have purchased it.
MAEAP Verification: Motivations and Opinions of Participating Producers

Dairy producers elect to participate in the Michigan Agriculture Environmental Assurance Program for a variety of reasons, including concerns about environmental regulations, possibility of lawsuits, and community awareness of their operations. A survey of MAEAP participants suggests that many producers believe establishing a Comprehensive Nutrient Management Plan through MAEAP has been beneficial to their operations. The information collected suggests ways to increase future participation in MAEAP.

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The Michigan Agriculture Environmental Assurance Program (MAEAP) is a voluntary program created in 1998 by multiple Michigan governmental, industry, and university entities. MAEAP’s purpose is to assist livestock producers with the management of nutrients—particularly those found in manure. To be MAEAP-verified a livestock farm must have an accurate and complete Comprehensive Nutrient Management Plan (CNMP) implemented by the producer. Those livestock producers who follow the pollution prevention strategies laid out in the CNMP may be able to reduce the risk of pollution discharges, nuisance complaints, and lawsuits. However, to date, the total participation in the MAEAP program has been small relative to potential participation. This article explores the reasons producers seek MAEAP verification and obstacles they encounter in becoming verified in order to increase understanding of how participation in MAEAP can be improved.

To determine the effectiveness of MAEAP, interviews were conducted with 29 producers from farms that, as of January 1, 2005, were either MAEAP-verified or soon-to-be verified. The 29 producers interviewed represented 63% of all MAEAP-verified livestock producers at that time. The interviewed producers managed a total of 31 operations with various livestock species with a wide range of farm sizes. Concentrated Animal Feeding Operations (CAFOs) and Animal Feeding Operations (AFOs) with fewer than 1000 animal units were examined separately. Among dairies, operations with greater than 700 mature dairy cows were classified as CAFOs.

58% of all operations became verified due, in part, to perceived current or future environmental regulations affecting their farm.

Motivation to Become MAEAP-verified

The motivation to become MAEAP-verified and to undertake a CNMP came from a variety of sources (Table 1). Fifty-eight percent of all operations became verified due, in part, to perceived current or future environmental regulations affecting their farm. This perception was most often held on large farms: 71% of CAFOs and only 43% of AFOs’ producers listed regulations as a reason their operations became verified.

Participation in voluntary programs may have been motivated by stewardship ethics. Of the total 29 producers interviewed, eight mentioned that they became verified because they felt it was the “right thing to do.” Some producers indicated that this statement meant they were doing the right things for the environment and their neighbors, others meant that they were setting a good example for other livestock producers in the state. Still others mentioned this statement because they foresaw better profits.

Another strong motivation mentioned was the desire to obtain technical and financial assistance. As part of the MAEAP verification process, producers received assistance to complete the CNMP, to understand the regulations affecting livestock production, and to access sources of financial assistance.

Challenges to Becoming MAEAP-Verified

The most significant hindrance for becoming MAEAP verified, affecting 41% of the 29 producers interviewed was the availability of cropland for land-applying manure (Table 2). Producers attributed this situation to several different factors, including the adequacy of the existing land base, the ability to use manure for its actual nutrient value, the feasibility of crop rotation, and the necessity of hauling manure a longer distance than before MAEAP verification. Also, there was concern about the time spent in spreading manure and keeping records. In order to be able to spread when they had more time, some producers had to change the way they managed their time. For example, one producer changed his rotation to...
replace corn grain with wheat.

Forty-one percent of all interviewees and 30% of the interviewed dairy producers were concerned about finding enough cropland that had a soil phosphorus level below 150 parts per million (ppm). If the soil tested above this level of phosphorus, but below 300 ppm, then manure could only be spread at agronomic removal rates. If the level was over 300 ppm, then no manure could be spread on that land. Furthermore, transporting manure is costly relative to its nutrient value.

Perhaps because MAEAP is a relatively new program, producers felt they had to deal with inconsistent information among the various participating governmental agencies. Forty percent of the dairy producers identified this inconsistency as an obstacle. Other factors that dairy producers identified as causing delays included inadequate manure storage (20%), finding enough time to keep the additional records (10%), and their own financial situation (10%).

Opinions

The opinions of MAEAP-verified livestock producers relative to MAEAP and the current environmental context were assessed. Each producer was asked to indicate his or her level of agreement with various statements.

Interviewed producers strongly disagreed with the statement, “Liability and lawsuits are of little concern for the livestock industry in Michigan.” This disagreement suggests that fear of liability issues and lawsuits may be an important motivation for seeking MAEAP verification. Several of the interviewed producers had had litigation brought against them, or they knew of a neighbor who had been subject to litigation.

The financing for pollution prevention also was addressed. The statement, “Even though clean water benefits the public, producers should pay for the majority of mandatory environmental practices to ensure pollution prevention” was disagreeable to interviewed producers. This result suggests that producers think that financial assistance should be available for becoming MAEAP-verified.

Other statements suggest a positive attitude toward the role that voluntary pollution prevention on the farm can play in protecting environmental quality. Interviewed producers either agreed or strongly agreed with these statements:

- MAEAP educational programs have helped me become a better steward.
- My CNMP is so valuable to my operation it is my intention to maintain and update it in the future.
- My farm operation can be profitable without causing or contributing to any significant water quality pollution.

Conclusion

This study shows that there are many motivations for becoming MAEAP-verified that vary among producers and by type of farm. Dairy producers were particularly concerned about environmental regulations, lawsuits, and community
awareness of their operation. These same producers found inconsistent information from agencies as a factor that could delay becoming MAEAP-verified and implementing a CNMP. Another concern was the availability of manure storage and land suitable for the spreading of manure. On average, the dairy producers did find that the MAEAP educational programs have helped to make them better stewards, and they indicated that they intend to update and maintain their CNMP and their MAEAP verification. They strongly believe that their farm operation can be profitable without causing or contributing to any significant water quality problem, although they, in general, believe the public should help to pay for mandatory environmental practices.

Table 2. Producer-identified obstacles to implementing required CNMP changes.

<table>
<thead>
<tr>
<th></th>
<th>Beef</th>
<th>Dairy</th>
<th>Poultry</th>
<th>Swine</th>
<th>Total</th>
<th>CAFO</th>
<th>AFO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>percentage of producers responding in the affirmative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land components</td>
<td>100%</td>
<td>30%</td>
<td>50%</td>
<td>33%</td>
<td>41%</td>
<td>50%</td>
<td>31%</td>
</tr>
<tr>
<td>Land base</td>
<td>33%</td>
<td>30%</td>
<td>50%</td>
<td>33%</td>
<td>34%</td>
<td>50%</td>
<td>15%</td>
</tr>
<tr>
<td>Manure book values</td>
<td>67%</td>
<td>0%</td>
<td>25%</td>
<td>17%</td>
<td>17%</td>
<td>13%</td>
<td>23%</td>
</tr>
<tr>
<td>Crop rotation</td>
<td>33%</td>
<td>10%</td>
<td>0%</td>
<td>8%</td>
<td>10%</td>
<td>19%</td>
<td>0%</td>
</tr>
<tr>
<td>Driving distance to spread manure</td>
<td>0%</td>
<td>0%</td>
<td>25%</td>
<td>8%</td>
<td>7%</td>
<td>13%</td>
<td>0%</td>
</tr>
<tr>
<td>Time (spreading manure &amp; record-keeping)</td>
<td>33%</td>
<td>10%</td>
<td>25%</td>
<td>42%</td>
<td>28%</td>
<td>19%</td>
<td>38%</td>
</tr>
<tr>
<td>Inconsistencies among agencies</td>
<td>0%</td>
<td>40%</td>
<td>0%</td>
<td>33%</td>
<td>28%</td>
<td>31%</td>
<td>23%</td>
</tr>
<tr>
<td>Adequate manure storage</td>
<td>0%</td>
<td>20%</td>
<td>50%</td>
<td>17%</td>
<td>21%</td>
<td>25%</td>
<td>15%</td>
</tr>
<tr>
<td>Finding a qualified plan provider</td>
<td>33%</td>
<td>0%</td>
<td>0%</td>
<td>25%</td>
<td>14%</td>
<td>13%</td>
<td>15%</td>
</tr>
<tr>
<td>Composting animals</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>17%</td>
<td>7%</td>
<td>0%</td>
<td>15%</td>
</tr>
<tr>
<td>Financial situation</td>
<td>0%</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
<td>0%</td>
<td>8%</td>
</tr>
<tr>
<td>Number of producers</td>
<td>3</td>
<td>10</td>
<td>4</td>
<td>12</td>
<td>29</td>
<td>17</td>
<td>12</td>
</tr>
</tbody>
</table>

Implications for MAEAP Administration

MAEAP verification can be an important step to obtaining reductions in pollution. To improve verified farm numbers, the results of this study suggest that MAEAP administrators can encourage those producers who are verified to explain the advantages to those livestock producers who have not yet participated in MAEAP. The fact that most of the interviewees agreed that they found the verification process and implementation of CNMP so valuable they were going to keep the CNMP updated in order to remain verified is worth emphasizing in future MAEAP messages. MAEAP administrators also can highlight the implications of current and foreseeable regulations for specific livestock farms' nutrient management practices because these regulations were prime motivators. The enhanced availability of financial and technical assistance via the MAEAP verification route is a strong motivator for many livestock producers and also should be emphasized in recruiting more participation. In some regions and locations, available land for spreading is an obstacle. Solutions such as planting crops that take up large quantities of phosphorus may be identified or the provision of a “clearing house” by MAEAP to match producers with available land with those with excess nutrients might increase participation numbers. Finally, assuring consistent messages from all agencies is important to increase MAEAP participation.
<table>
<thead>
<tr>
<th>Opinion statements</th>
<th>Beef</th>
<th>Dairy</th>
<th>Poultry</th>
<th>Swine</th>
<th>Total</th>
<th>CAFO</th>
<th>AFO</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAEAP educational programs have helped me become a better steward</td>
<td>2.0</td>
<td>2.2</td>
<td>1.3</td>
<td>1.6</td>
<td>1.8</td>
<td>1.9</td>
<td>1.6</td>
</tr>
<tr>
<td>Michigan governmental agencies are doing a good job helping producers reduce pollution without substantially hurting profits</td>
<td>2.7</td>
<td>2.8</td>
<td>2.3</td>
<td>2.6</td>
<td>2.7</td>
<td>2.6</td>
<td>2.4</td>
</tr>
<tr>
<td>My CNMP is so valuable to my operation it is my intention to maintain and update it in the future</td>
<td>2.0</td>
<td>2.4</td>
<td>2.3</td>
<td>1.5</td>
<td>2.0</td>
<td>2.1</td>
<td>1.7</td>
</tr>
<tr>
<td>Liability and lawsuits are of little concern for the livestock industry in Michigan</td>
<td>4.7</td>
<td>4.9</td>
<td>4.8</td>
<td>3.9</td>
<td>4.5</td>
<td>4.1</td>
<td>4.6</td>
</tr>
<tr>
<td>Trends in environmental regulation are clear enough to justify changing my environmental practices, even those that require permanent structure investments</td>
<td>3.0</td>
<td>2.6</td>
<td>2.0</td>
<td>3.2</td>
<td>2.7</td>
<td>2.9</td>
<td>2.4</td>
</tr>
<tr>
<td>My farm operation can be profitable without causing or contributing to any significant water quality pollution</td>
<td>1.0</td>
<td>1.3</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.1</td>
<td>1.0</td>
</tr>
<tr>
<td>The law requiring “no discharge” of polluted runoff over land or via tiles is adequate to counteract agricultural water pollution</td>
<td>2.3</td>
<td>2.7</td>
<td>2.8</td>
<td>2.8</td>
<td>2.7</td>
<td>2.4</td>
<td>2.9</td>
</tr>
<tr>
<td>Even though clean water benefits the public, producers should pay for the majority of mandatory environmental practices to ensure pollution prevention</td>
<td>4.0</td>
<td>3.5</td>
<td>4.8</td>
<td>3.7</td>
<td>3.8</td>
<td>3.8</td>
<td>3.7</td>
</tr>
<tr>
<td>Modern agriculture is a cause of environmental problems and needs continual, careful management to be environmentally sound</td>
<td>3.7</td>
<td>3.3</td>
<td>3.3</td>
<td>2.7</td>
<td>3.0</td>
<td>3.1</td>
<td>2.8</td>
</tr>
<tr>
<td>Number of producers</td>
<td>3</td>
<td>10</td>
<td>4</td>
<td>12</td>
<td>29</td>
<td>17</td>
<td>12</td>
</tr>
</tbody>
</table>

1 Where 1=Strongly agree, 2=Agree, 3=No opinion, 4=Disagree, 5=Strongly disagree
Bioenergy technology holds promise for strengthening agriculture and conserving natural resources, making it an extremely important issue for Michigan dairy farmers. If bioenergy is to reach its full potential, though, the agriculture and bioenergy industries need to work together to more closely link cropping systems, animal agriculture, and the bioenergy industry.

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Seen as a way to diminish our dependence on fossil fuels, revitalize agriculture, and reduce greenhouse gases, the advantages of bioenergy are seemingly endless. But bioenergy, or renewable energy derived from organic matter, can’t be created in a vacuum. The process is closely entwined with crop production and animal agriculture and, subsequently, could also have a positive effect on Michigan dairy producers and the state’s overall economy. To realize that potential, the animal agriculture and bioenergy industries must be closely linked.

Fuel and Bioenergy

Two examples of bioenergy are the biofuels ethanol and biodiesel. Ethanol is produced from grains. Corn is the usual feedstock of choice, although vast supplies of cellulosic material offer additional potential opportunities. In newer ethanol plants, dry-milled grain is mixed with water to form a mash. Enzymes are added and the mixture is heated before being allowed to ferment. The main products are ethanol, carbon dioxide, and animal feed. Animal feed is marketed as dried distiller’s grains with solubles (DDGS). Biodiesel is made from vegetable oils and waste greases. Oil crops include soybeans and canola. A byproduct of bio-diesel production is protein-rich flakes, which also have potential use in animal feed.

Connecting the Industries

Because animal feeds are important byproducts of both ethanol and biodiesel production, the connection between bioenergy and animal agriculture is obvious. But these connections to animal agriculture are seldom mentioned in discussions about ethanol and biodiesel production. An exception is in the case of economic analyses where a value is assigned to the animal feed byproduct as a source of revenue. For example, the share of the total revenue of an ethanol plant typically contributed by sale of DDGS ranges from 15 to 20% (1).

In spite of that, the first and foremost consideration when situting an ethanol plant is proximity to corn production, not livestock production. In fact, one of the major markets for DDGS in North America is California. Freight costs to this market from locations in the western corn belt are approximately $50 per ton (2). This is for a byproduct that may account for 15 to 20% of plant revenue and is valued at $80 to $120 per ton as animal feed. Such cases illustrate the economic influence of livestock production on the bioenergy industry.

Environmental costs are another important consideration. In large-scale livestock production, especially hogs and chickens, less attention is being paid to the tie to a local land base for feed inputs or manure for crop production (3). The result is that manure is produced where sufficient crop land is often not available for utilizing the manure nutrients. On the crop end, commercial fertilizers replace manure nutrients that otherwise might have been used. The feed is transported to the animals. However, the cost of transporting manure in the opposite direction rarely can be justified because of its low dry matter content.

Just as is the case for food production, agricultural production of bioenergy will create fewer problems for the environment when the crop and livestock systems are closely coupled.

Addressing the Links

To return to the question of why animal production is often ignored in discussions of bioenergy, the answer may simply be that the connection is often overlooked. That answer is not entirely satisfying, though, because connections between bioenergy and animal agriculture industry are closely linked, whether for production of food or bioenergy.

Or, is the connection to animal agriculture being ignored because of an unwillingness to address the issues associated with dealing with animal manure? The glamour of bioenergy is diminished when coupled with finding ways to handle manure in a way that is affordable to the farmer, friendly to the environment, and acceptable to society.
is diminished when coupled with finding ways to handle manure in a way that is affordable to the farmer, friendly to the environment, and acceptable to society.

Bioenergy is an important and desirable segment of our future. But because byproducts of bioenergy production are important sources of animal feed, ethanol plants will benefit from marketing DDGS to nearby livestock producers.

Furthermore, a large number of animals produce large quantities of manure, regardless of the proximity of the livestock and the cropland which is the origin of their feed. Thus, management of the manure must be a part of the total equation. For example, anaerobic digestion is a cornerstone for an integrated manure management system, setting the stage for innovative manure treatments that return value to the farmer and enhance environmental and social acceptability. And, the biogas from anaerobic digestion of the manure (and other substrates) can be an important source of energy for a biofuels plant.

Conclusion

Agriculture is a vital part of the Michigan economy. Successful Michigan agriculture depends upon closely linking cropping systems and animal agriculture. These links are essential whether agriculture is viewed as a food production system or as a source of organic matter for bioenergy.

References


Photo by Jacob McCarthy

US BioEnergy opened Michigan's third ethanol plant Sept. 14 in Woodbury. The plant will use more than 16 million bushels of corn to produce 50 million gallons of ethanol annually and 160,000 tons of dried distiller's grains, an animal feed byproduct of ethanol production.
A historic publicity stunt, members of the football team milk a cow.

A Michigan State University student explains the finer points of milking to a visitor during the Great Dairy Adventure, Summer 2006.

Making old-fashioned ice cream at the dairy food complex.

Take a trip back in time. To 1906 when the Department of Animal Science had its beginnings with the formation of the Poultry Husbandry department. To the 1930’s when Malcolm Trout began popularizing the homogenization of milk. To 1994, when the $70 million Animal Agriculture Initiative allowed the Department of Animal Science to build cutting-edge facilities and hire new, talented staff.

The Agricultural College of the State of Michigan was founded in 1855 as the pioneer land-grant institution in the U.S. The institution name was changed five times before becoming Michigan State University in 1964. Animal agriculture has been a part of that tradition from the very beginning, when draft horses hauled lumber to build the first campus structures.

Animal studies at MSU were divided into many departments over the years. Organized in 1910, the Dairy Department originally offered only dairy manufacturing courses. Dairy production courses such as elementary dairying, creamery butter making, cheese making and market milk were taught under the auspices of the Animal Husbandry Department until 1921.

In the 1920’s, under new head of the Dairy Department O.E. Reed, management, manufacturing and production courses came to be taught exclusively in the Dairy Department. By 1925, courses...
100 Years of Animal Science
State University

included composition of milk, dairy plant management, production of milk products, dairy cattle judging, dairy breeds, barn practices, and farm management.

Reed also partnered with J.F. Cox, head of the Department of Farm Crops, to promote a dairy alfalfa campaign, a dairy industry milestone. Dairy experts recommend the development of highly productive dairy herds through selection, care, feeding, and testing to eliminate poor producers. Crop experts explained the need for reliable seed, soil testing, liming, planting, harvesting, and storage of alfalfa.

Along with the animal husbandry, dairy, poultry, horse and farm departments people have been actively engaged in Animal Science for decades. It was not until 1980, however, that the departments were merged into today’s Department of Animal Science.

From our humble beginnings in Agriculture Hall to today’s cutting-edge laboratories dedicated to research in nutrition, management, genetics, physiology, and biotechnology, the department has experienced success and recognition. These accomplishments are not the work of one person, or any one group of people. Instead, it is the work of partnerships.

We invite you to continue our partnership by joining us for our centennial celebrations in November. It will be an opportunity to reflect on our collective success, and look toward the future.

Fun, Food, Football

Alumni, faculty and friends of the Michigan State University Department of Animal Science are invited to help celebrate the department’s 100th anniversary during AutumnFest weekend, Nov. 10-11.

Friday, Nov. 10 festivities include:

- 10:00 a.m. — Informal Open House (Anthony Hall)
- 1:00 p.m. — Lecture Series (MSU Pavilion for Agriculture and Livestock Education)
  Featuring Dale Bauman, Cornell University - “When I grow up, I am going to be a dairy nutritionist”; Harlan Ritchie, MSU - “46 years and counting”; Donna Banks, Kellogg Company – “TBD”; and Karen Plaut, MSU – “Looking toward the future”.
- 3:30 p.m. — Facilities Tour (Campus farms)
- 6:00 p.m. — Celebration dinner (Kellogg Center)
  Featuring Kim Wilcox, MSU Provost; Dan Wyant, Edward Lowe Foundation, former director of the Michigan Department of Agriculture; and John L. Smith, MSU head football coach.

Saturday, Nov. 11 festivities include:

- 7:00 a.m. — Alumni Breakfast (Horse Teaching and Research Center)
- Alumni Olympics (Horse Teaching and Research Center)
- 3 hours prior to football game kick-off — AutumnFest (MSU Pavilion)
- MSU Spartans v. University of Minnesota Gophers Football Game (Spartan Stadium)


The dairy building was built in 1913 at a cost of $55,000. The next new dairy structure was a dairy barn built in 1929 to house 142 mature cows and young stock.

Photos courtesy Dept. of Animal Science
Net Merit – Updated in August 2006

The 2006 revision of Net Merit (NMS) includes an improved definition of productive life and new genetic evaluations for service sire and daughter stillbirth. It is important that dairy producers routinely review their genetic selection criteria and know where service sires rank compared with other active AI bulls.

Kathy Lee
Extension Dairy Educator
Northwest Lower Michigan

Net Merit (NMS) was revised in August, 2006 to ensure its usefulness as a genetic selection tool that includes economically important production and fitness traits. The enhancements include a modification to the definition of productive life, addition of two traits influencing calving ability, and updates to the economic weights for traits in NMS.

Researchers at USDA’s Animal Improvement Programs Laboratory (AIPL) strive to provide genetic evaluations that meet the needs of today’s dairy producers. During the past decade, USDA-AIPL has developed methods to use DHI data to generate genetic evaluations for several fitness traits that impact a cow’s profitability (e.g., somatic cell score, productive life, daughter pregnancy rate). Two new traits, Service Sire Stillbirth and Daughter Stillbirth, were added to NMS for Holsteins with the August, 2006 genetic update.

The revised calculation of productive life gives credit to extended lactations and months in milk after 84 months of age. The economic weights for traits in the NMS calculation now more accurately reflect the traits’ current economic impact in commercial dairy herds.

PTAs for Productive Life

Predicted transmitting abilities for productive life (PTA PL) are based on months in lactation through a specified age for a cow. Since PTA PL was introduced in 1994, cows have been credited with up to 10 months per lactation through 7 years of age (84 months). Days in milk data beyond 305 days and months in lactation past 7 years of age were not included in productive life calculations.

The revised productive life trait now incorporates days in milk data for the entire lactation and months past 84 months of age to the total herd life of the cow. Each month of lactation receives a different amount of credit based on the shape of the lactation curve. The largest weightings will be given to those months at the peak of lactation and extended months in milk will receive diminishing credit. More emphasis is placed on beginning a new lactation than continuing an extended lactation. First lactations will receive less credit than later lactations in proportion to the difference in average production. Lactation-curve credits ensure that cows with multiple lactations get more credit than cows with a single long lactation.

The range of PTA PL is increased by about 40%. Based on August, 2006 data for Active AI bulls, PTA PL ranges are from -4.7 to +7.5 months for Holsteins and from -1.0 to +4.2 months for Jerseys. Active AI Holstein bulls had an average PTA PL of +0.8 months while the average PTA PL for Jersey bulls is +1.7 months.

Stillbirth Evaluations

Stillborn calves represent a significant economic loss to dairy producers. USDA-AIPL reported stillbirth incidences of 12% for calves of first lactation cows and 5% for calves of second or later lactation cows. For the genetic evaluations, stillbirth is defined as calves born dead or that die within 48 hours of birth, with a vast majority of the stillborn calves being born dead.

Two stillbirth evaluations are calculated for Holstein sires with adequate data. Service sire stillbirth (SSB) measures the tendency of calves from a particular sire to be stillborn. As an example, a sire with SSB of 8% will produce 4% fewer stillborn calves than a sire with a 12% SSB. Daughter stillbirth (DSB) estimates the tendency of daughters of a particular sire to produce stillborn calves.

Heritability of stillbirths is relatively low – approximately 3%. Consequently, the most effective way to incorporate stillbirth evaluations in a sire selection program is to include them in a selection index, such as NMS.

For Holsteins only, NMS now includes stillbirth genetic evaluations. The stillbirth evaluations (SSB and DSB) plus daughter calving ease (DCE) and service sire calving ease (SCE) have been combined into a Calving Ability composite (CAS). CAS is the lifetime dollar benefit of less calving difficulty and fewer stillbirths. In CAS calculations for Holsteins, relative emphasis on calving ease is 40% and 60% on stillbirth.

CAS is calculated for Brown Swiss using only service sire and daughter calving ease evaluations. CAS is not available for the other dairy breeds because calving ease and stillbirth genetic evaluations are not calculated due to insufficient data.

Updated Economic Weights

Economic weights for the traits in the NMS calculation were updated in August, 2006. NMS estimates lifetime profit based on incomes and expenses relevant for today’s dairy producers. Table 1 lists the relative emphasis of each trait in NMS.
for Holsteins and Brown Swiss. Calving Ability composite (CAS) is not calculated for the other dairy breeds. For those breeds, the relative emphasis on each trait excluding CAS can be estimated by multiplying the values in Table 1 by 1.06.

A significant outcome of updated economic weights is that overall emphasis on non-production traits is now 54%, compared with 45% for NMS 2003. The production traits (fat and protein) have a combined emphasis of 46%. Since 2003 fat and protein are the only production traits included in NMS to reflect that a majority of milk in the U.S. is now marketed based on multiple component pricing.

The weight for somatic cell score is negative because lower values are more profitable. The negative weight for body size reflects that large Holstein cows tend to generate lower lifetime profit than their moderate-sized contemporaries in commercial dairy herds.

Daughter pregnancy rate now receives a relative weight of 9% compared with 7% for NMS 2003. Higher replacement heifer prices contributed to the increased emphasis on productive life (17% compared with 11% in the 2003 version of NMS).

Dairy producers should routinely review their genetic selection criteria and make adjustments as needed. Table 2 lists the NMS values for various percentile ranking levels for each breed. Knowing where service sires rank relative to other active AI bulls is helpful in determining if the sires meet your goals. To maximize genetic improvement, it is recommended that the service sires in your herd average at or above the 80th percentile.

Summary

Net Merit $ is a useful tool in predicting the total performance of a bull’s daughters over their lifetime. Revisions to NMS and the traits included in the index continue to ensure that dairy producers have an up-to-date tool for making sire selection decisions.

References

Cassell, B. 2006. Net Merit gets new look this August.

Table 1. Relative economic weights of traits included in Net Merit (NMS) for Holsteins and Brown Swiss.

<table>
<thead>
<tr>
<th>Trait</th>
<th>Relative Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat (lb)</td>
<td>23%</td>
</tr>
<tr>
<td>Protein (lb)</td>
<td>23%</td>
</tr>
<tr>
<td>Milk (lb)</td>
<td>0%</td>
</tr>
<tr>
<td>Productive life (mo)</td>
<td>17%</td>
</tr>
<tr>
<td>Somatic cell score</td>
<td>-9%</td>
</tr>
<tr>
<td>Udder composite</td>
<td>6%</td>
</tr>
<tr>
<td>Feet/leg composite</td>
<td>3%</td>
</tr>
<tr>
<td>Body size composite</td>
<td>-4%</td>
</tr>
<tr>
<td>Daughter pregnancy rate</td>
<td>9%</td>
</tr>
<tr>
<td>Calving ability $^1$</td>
<td>6%</td>
</tr>
</tbody>
</table>

\(^1\) Calving ability $ (CAS)$ is an index of four traits for Holsteins: service sire calving ease (SCE), daughter calving ease (DCE), service sire stillbirth, and daughter stillbirth. CAS for Brown Swiss includes SCE and DCE only.


Table 2. NMS levels of top percentiles for AI sires by breed. August 2006 USDA Sire Summary

<table>
<thead>
<tr>
<th>Breed</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>85</th>
<th>90</th>
<th>95</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Net Merit $ Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ayrshire (22)(^1)</td>
<td>40</td>
<td>87</td>
<td>100</td>
<td>202</td>
<td>207</td>
<td>217</td>
<td>224</td>
</tr>
<tr>
<td>Brown Swiss (44)</td>
<td>276</td>
<td>310</td>
<td>341</td>
<td>392</td>
<td>394</td>
<td>411</td>
<td>431</td>
</tr>
<tr>
<td>Guernsey (22)</td>
<td>155</td>
<td>177</td>
<td>206</td>
<td>237</td>
<td>238</td>
<td>266</td>
<td>294</td>
</tr>
<tr>
<td>Holstein (660)</td>
<td>238</td>
<td>279</td>
<td>319</td>
<td>363</td>
<td>383</td>
<td>411</td>
<td>445</td>
</tr>
<tr>
<td>Jersey (96)</td>
<td>273</td>
<td>288</td>
<td>311</td>
<td>362</td>
<td>378</td>
<td>418</td>
<td>446</td>
</tr>
</tbody>
</table>

\(^1\) Numbers of bulls in the current active AI population for each breed are in parentheses.
Environmental Management

MAEAP Involvement Spurs Changes in Small and Medium-Sized Michigan Farms

A record number of farms participated in the Michigan Agriculture Environmental Assurance Program in 2005, and many of them made changes that went beyond merely meeting regulations. A summary of changes made on Michigan farms of small and medium size shows that many forward-thinking producers are voluntarily taking steps to reduce negative environmental impacts.

Jan Wilford
Michigan Department of Agriculture

Although small and medium-sized livestock operations have the potential to contribute to water quality problems, most are not required to follow those specific rules that apply to large sized animal feeding operations. However, all farms are subject to Michigan law that prohibits any discharge of pollutants that harm water quality. Farmers understand that addressing agricultural pollution concerns in their facilities in a timely fashion may prevent more prescriptive regulatory solutions. Practice changes made on small and medium sized livestock farms in 2005 through involvement in the Michigan Agriculture Environmental Assurance Program (MAEAP) reflect these farmers’ commitment to voluntarily address environmental resource concerns in their farms (Table 1).

MAEAP provides an excellent opportunity for Michigan farmers to proactively and voluntarily manage their farms for the protection and enhancement of soil and water quality. With confidentiality guaranteed by law, MAEAP provides a structure under which Michigan farmers can be assured they are effectively using all current Right to Farm Generally Accepted Agricultural and Management Practices (GAAMPS) and are complying with state and federal environment laws specific to the program. For livestock producers, the pinnacle of accomplishment in MAEAP is farm verification, which results from an independent farm inspection following the implementation of a Comprehensive Nutrient Management Plan (CNMP).

Some producers may elect to immediately pursue the completion of a CNMP and verification. However, the “comprehensiveness” of a CNMP can be daunting. Therefore, many producers who own operations of small or medium size find that smaller, more progressive steps in environmental protection and improvement are both economical and practical.

Progressive Approach

The MAEAP Livestock System Progressive Planning approach to environmental assurance is designed to meet the needs of those small and medium-sized livestock operations owned by producers who are not yet interested, ready, or able to implement a CNMP and receive verification. The Progressive Planning approach offers seven options reflecting components of a CNMP. Producers can work on these options at their own pace. One-on-one, confidential guidance and assistance from the non-regulatory MAEAP partnering organizations are available. As progress is made, additional goals and timeframes are established.

2005 Accomplishments

- A record 550 small and medium sized farms participated in MAEAP Progressive Planning.
- Dairy farms represented the largest participation with 485 farms, 88% of the total.
- Swine followed with 16 farms, 3% of the total and beef with 11 farms, 2% of the total. Thirty-eight farms, 7% of the total, had mixed species.
- Participating dairies own over 31,500 cows/young stock of less than 1000 lb and almost 38,000 cows over 1000 lb, managed on 155,000 acres.
- Almost 20% of the small and medium-sized farms eliminated a direct discharge of agricultural pollutants to lakes, streams or ditches. A total of 130 direct discharges were eliminated on 101 farms.
- Twelve percent of the participating farms eliminated at least one area of high risk of discharge. A total of 186 high discharge risks were eliminated.
- Almost 700 changes were made to achieve nutrient sustainability, including adding additional acres, reducing animal numbers, moving to higher yield crops, changing crop rotations, and reducing phosphorus in feed rations.
- Almost 50% of involved farms adopted or modified their soil testing regimen.
- Approximately one-third of involved farms reduced commercial fertilizer applications and developed record keeping systems. Almost one third calibrated manure equipment and adopted the Right to Farm phosphorus guidelines.
- Over 1000 conservation practices were implemented including site specific field evaluations, mapping
The MAEAP Livestock System Progressive Planning provides a unique opportunity for Michigan livestock producers to address pollution concerns in their facilities. Participants in this program can choose the approach that best fits their operation by completing a Comprehensive Nutrient Management Plan (CNMP) or a less formal Progressive Planning approach. Either option allows producers to demonstrate their commitment to environmental stewardship and regulatory compliance. 

The Progressive Planning approach is designed to meet the needs of smaller livestock operations owned by producers who are not yet interested, ready, or able to implement a CNMP and receive verification. The Progressive Planning approach to environmental assurance is designed to meet the needs of those small and medium-sized livestock operations and can be used to plan and implement nutrient management actions on a farm. Producers can work with MAEAP professionals to develop a Progressive Plan that reflects their operations’ specific nutrient management needs and financial constraints. These plans can be used to develop and implement a CNMP at a later point in time.

A record 550 small and medium sized farms participated in the Michigan Agriculture Environmental Assurance Program (MAEAP) Progressive Planning in 2005. Over 1000 changes were made to achieve nutrient management compliance on these farms, including addressing agricultural pollution concerns in their facilities and are complying with state and federal environment laws and regulations. A summary of changes made on Michigan farms applying to small and medium sized livestock operations are presented in Table 1.

Table 1. MAEAP Progressive Planning 2005 Practice Changes on Small and Medium Livestock Farms.

<table>
<thead>
<tr>
<th>Practice Change</th>
<th>Number of Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total farms</td>
<td>550</td>
</tr>
<tr>
<td>Farms with at least 1 discharge</td>
<td>101</td>
</tr>
<tr>
<td>Farms with at least 1 high risk</td>
<td>67</td>
</tr>
<tr>
<td>Discharges eliminated</td>
<td>130</td>
</tr>
<tr>
<td>Milking center</td>
<td>37</td>
</tr>
<tr>
<td>Concrete lot runoff</td>
<td>35</td>
</tr>
<tr>
<td>Dirt lot runoff</td>
<td>27</td>
</tr>
<tr>
<td>Silage runoff</td>
<td>29</td>
</tr>
<tr>
<td>Storage breach</td>
<td>2</td>
</tr>
<tr>
<td>High discharge risks eliminated</td>
<td>186</td>
</tr>
<tr>
<td>Milking center</td>
<td>49</td>
</tr>
<tr>
<td>Concrete lot runoff</td>
<td>43</td>
</tr>
<tr>
<td>Dirt lot runoff</td>
<td>29</td>
</tr>
<tr>
<td>Silage runoff</td>
<td>44</td>
</tr>
<tr>
<td>Storage integrity</td>
<td>21</td>
</tr>
<tr>
<td>Achieve nutrient balance</td>
<td>697</td>
</tr>
<tr>
<td>Additional acres</td>
<td>108</td>
</tr>
<tr>
<td>Fewer animals</td>
<td>37</td>
</tr>
<tr>
<td>Higher yield crops</td>
<td>232</td>
</tr>
<tr>
<td>Crop rotation</td>
<td>219</td>
</tr>
<tr>
<td>Reduce ration phosphorus</td>
<td>101</td>
</tr>
<tr>
<td>Spreading plan components</td>
<td>1,342</td>
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<tr>
<td>Soil testing</td>
<td>253</td>
</tr>
<tr>
<td>Manure analysis</td>
<td>126</td>
</tr>
<tr>
<td>Reduce fertilizer</td>
<td>192</td>
</tr>
<tr>
<td>More acres</td>
<td>136</td>
</tr>
<tr>
<td>Follow P rule</td>
<td>155</td>
</tr>
<tr>
<td>Calibrate equipment</td>
<td>150</td>
</tr>
<tr>
<td>Record keeping</td>
<td>172</td>
</tr>
<tr>
<td>Incorporate manure</td>
<td>139</td>
</tr>
<tr>
<td>PSNT</td>
<td>19</td>
</tr>
<tr>
<td>Employee training actions</td>
<td>143</td>
</tr>
<tr>
<td>Developed plan</td>
<td>47</td>
</tr>
<tr>
<td>Trained employees</td>
<td>25</td>
</tr>
<tr>
<td>Deliberate communication</td>
<td>71</td>
</tr>
<tr>
<td>Discharges eliminated</td>
<td>130</td>
</tr>
<tr>
<td>Conservation practices</td>
<td>1,030</td>
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<tr>
<td>Field evaluations</td>
<td>175</td>
</tr>
<tr>
<td>Map sensitive areas</td>
<td>105</td>
</tr>
<tr>
<td>Increase setbacks</td>
<td>111</td>
</tr>
<tr>
<td>Install buffers</td>
<td>104</td>
</tr>
<tr>
<td>Cover crop</td>
<td>123</td>
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<tr>
<td>Minimal tillage/residue</td>
<td>169</td>
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<tr>
<td>Tillage pre-application</td>
<td>85</td>
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<tr>
<td>MARI ranking</td>
<td>158</td>
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<tr>
<td>Emergency planning actions</td>
<td>539</td>
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<tr>
<td>Phone number</td>
<td>135</td>
</tr>
<tr>
<td>Identify risks</td>
<td>124</td>
</tr>
<tr>
<td>Line up equipment</td>
<td>98</td>
</tr>
<tr>
<td>Create plan</td>
<td>98</td>
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<tr>
<td>Train</td>
<td>84</td>
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<tr>
<td>Mortality management</td>
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<td>Timely disposal</td>
<td>256</td>
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<td>Burial rules</td>
<td>213</td>
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<tr>
<td>Composting initiated</td>
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<td>Compost management</td>
<td>32</td>
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<tr>
<td>Leachate management</td>
<td>18</td>
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<tr>
<td>Rendering</td>
<td>26</td>
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<tr>
<td>Landfill</td>
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<tr>
<td>Odor management</td>
<td>300</td>
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<tr>
<td>Odor management plan</td>
<td>48</td>
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<tr>
<td>Cover</td>
<td>1</td>
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<td>Treatment</td>
<td>6</td>
</tr>
<tr>
<td>Biofilter</td>
<td>1</td>
</tr>
<tr>
<td>Shelterbelt</td>
<td>7</td>
</tr>
<tr>
<td>Offset</td>
<td>17</td>
</tr>
<tr>
<td>Community relations</td>
<td>220</td>
</tr>
<tr>
<td>Sharps and Vet wastes contained</td>
<td>202</td>
</tr>
</tbody>
</table>
Sound nutrient management is not limited by state boundaries. Regardless of where they live or what their state requires of farmers, farm consultants, technical service providers, professional engineers, and agency staff members can acquire the necessary skills to develop comprehensive nutrient management plans (CNMPs) during a Nov. 7-9, 2006 training program at the Holiday Inn, Lima, Ohio.

MSU Extension, Ohio State University Extension and Purdue Extension, along with the Natural Resources Conservation Service (NRCS), are working together to provide CNMP development training. The program will equip participants to educate farmers about how CNMPs can minimize the risk of negative environmental impacts of animal operations and how they can use manure nutrients for crop production.

During the 3-day class, instructors will provide practical, hands-on instruction and tips for successful plan development. All of the components required by the NRCS for producers to qualify for Environmental Quality Incentives Program (EQIP) cost-share funds will be covered. A sample dairy CNMP will be available for review.

The class will run from 8 a.m. to 4:30 p.m. each day. Participants can receive certified crop advisor continuing education credits. National NRCS approval is pending.

The registration fee, which includes materials, breaks and lunch each day, is $375 until Oct. 6. After that date the fee will be $450. There will be no on-site registration.

For more details or to register, call Natalie Rector MSU Extension at 269-781-0908 or Greg La Barge at OSU Extension at 419-337-9210.

CNMP Provider Training

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For More Information

Summary tables of all 2005 Progressive Planning Practice Changes on Small and Medium-Sized Livestock Farms and species totals can be obtained at <http://www.maeap.org>. Click on the Livestock System and use the “search” option for Progressive Planning.

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Planning Options

The order and priority of each of the seven different Progressive Planning options is determined by the farmer to match farm-specific environmental, business, and production goals. The options are:

- **Confidential Site Review and Completed Action Plan.** This detailed review by a skilled technical advisor looks at common areas of concern and farm specific risks at the production area.
- **Whole Farm Nutrient Balance.** This component of the long-term sustainability of a livestock farm balances nutrients generated through the livestock system with nutrients used within a cropping system.
- **Manure Spreading Plan.** Includes soil testing, manure sampling, rate of manure per acre, nutrients per acre, the pre-sidedress nitrate test, record keeping, planning, and long term sustainability.
- **Conservation Practices on Fields Used for Manure Application.** Includes evaluating the potential for sensitive areas, planting cover crops, changing tillage practices, installing buffers, and evaluating fields for the appropriateness of winter manure application.
- **Almost half of all participants modified their mortality management practices to include timely disposal.**
- **Forty percent developed a plan to enhance relations with neighbors related to manure application and odor management.**

For More Information

Summary tables of all 2005 Progressive Planning Practice Changes on Small and Medium-Sized Livestock Farms and species totals can be obtained at <http://www.maeap.org>. Click on the Livestock System and use the “search” option for Progressive Planning.
The impact of poor conception rates on dairy farm efficiency and profitability cannot be underestimated. However, on-farm materials to assist training of personnel in the fundamentals of reproductive management, such as artificial insemination, detection of estrus, synchronization of ovulation, and pregnancy diagnosis, can be limited. Now, such information is only a few keystrokes away. Animal scientists at Michigan State University have developed a new free online teaching tool that provides tutorials on the above topics and other key aspects of reproductive management of dairy cattle.

The Virtual Dairy Cattle Encyclopedia of Reproduction available at <http://www.canr.msu.edu/vdcer> features over 400 pages of readily accessible information with vivid photographs, illustrations, videos, and diagrams on the reproductive physiology of dairy cattle and instruction on procedures (Figure 1) integral to successful reproductive management.

Topics covered in this online resource include the fundamentals of reproductive physiology, detection and synchronization of estrus, artificial insemination, economic impact of reproductive efficiency, reproductive management strategies, pregnancy diagnosis, ultrasonography, embryo transfer, and biotechnology. A comprehensive glossary of important terms utilized in the tutorials also is included on the Web site as well as a self test at the end of each tutorial to test knowledge of principles covered.

The Virtual Dairy Cattle Encyclopedia of Reproduction was created as the educational component of a large USDA Initiative for Agricultural and Food Systems Competitive Grant awarded to investigators from Michigan State University, the University of Wisconsin-Madison, and Virginia Polytechnic Institute and State University focused on enhanced dairy farm efficiency and profitability. It is intended to serve as an online resource and teaching tool for producers, veterinarians, farm personnel, and students interested in reproductive management of dairy cattle.

The Virtual Dairy Cattle Encyclopedia of Reproduction features over 400 pages of multi-media information. It has the potential to be a valuable resource for dairy producers, veterinarians, farm personnel and students.
The US milk-to-feed price ratio is currently very low—2.48 in August (Figure 1). Milk Income Loss Contract payments are helping farms with eligible production. The payment was $0.966/cwt for September and will be $0.432/cwt for October. In August, the payment of $0.925/cwt was enough to increase the milk-to-feed price ratio to 2.94. Milk prices are not exceptionally low relative to the prolonged low prices in 2000, 2002 and 2003. However, input costs, especially those tied to energy prices, have increased substantially so that the milk-to-feed price likely understates the financial distress on-farm at the current time.

Low milk prices and higher input costs are squeezing dairy farmer profits and cash flow. Unfortunately, one simple solution to cash flow problems is not available to most farmers. In 2002 and 2003 very low interest rates enabled some farmers to roll short-term debt into longer-term debt to improve cash flow. However, interest rates are higher (but not excessively so) and the refinancing already has occurred.

High milk prices and low feed prices in 2004 and 2005 spurred the large increase in milk cow numbers (Figure 2). US milk cow numbers surged from 8.984 million in February 2005 to 9.137 million in June 2006. US numbers did fall 13,000 from June to July 2006 perhaps marking a turning point that will lead to declines in quantity of milk supplied. Michigan milk cow numbers have grown from 297,000 in April 2004 to 321,000 in July 2006. The most recent (July 2006) replacement heifer price statistics reports Michigan at $1,800/head which is higher than most other top dairy states perhaps reflecting a steady demand to fill expanded dairy facilities.

The past two periods of very low milk prices (which I will define as a Class III price below $11/cwt) were both 16 months long from November 1999 through March 2001 and March 2002 through July 2003. This time Class III prices have been at or below $11/cwt since March 2006. Futures markets and other forecasts are predicting prices above $12/cwt for the fall months. This amounts to a bit of a recovery consistent with a typical seasonal pattern. Cheese stocks showed a strong rate of increase in June and July despite the heat wave in the West. Milk cow numbers need to turn down before the market will have confidence in higher milk prices.
In July, 2006, the Dairy Team at Michigan State University unveiled the Spartan Nutrient Cycle Card, a detail of the flow and recycling of nitrogen, phosphorus and potassium through a dairy farm. Making sure the nutrients in manure remain in the rootzone is an integral part of maximizing nutrient use. In addition, improper storage and handling of manure have direct financial and environmental implications. The Spartan Nutrient Cycle Card was developed to assist producers in balancing the flow of nutrient imports and exports across farm boundaries to minimize nutrient loss and maximize efficient nutrient use.

**About the Card**

The Spartan Nutrient Cycle Card is printed on a heavy card stock the size of sheet of paper and laminated to withstand the demands of on-farm use. The front of the card illustrates the flow of nutrients within the farm and across farm boundaries. An example of nutrient flow within the farm is phosphorus moving from rations to animals upon consumption. Examples of nutrients moving across farm boundaries are the purchase of commercial fertilizer or loss of nutrients to groundwater in land-applying manure. The Spartan Nutrient Cycle Card identifies four critical control points at which specific steps can be taken to maximize nutrient use. On the reverse side of the card is a checklist of practices that can be employed at each critical control point to optimize use of nutrients within the farm nutrient cycle.

The Spartan Nutrient Cycle Card can be a valuable resource for on-farm reference as it clearly illustrates the movement of nutrients between farm units and across farm boundaries. By employing the practices in the checklist financial gains on the farm can be realized and impact to surrounding environment minimized. A hole is punched in the top left corner of the card so that it may be hung from a nail for frequent reference.

**Getting the Card**

Within the next several months the Spartan Nutrient Cycle card will be distributed to every dairy producer in Michigan. It also can be viewed and printed electronically—just visit <http://www.mdr.msu.edu/nutrientcycle>. To specifically request a card or to ask questions regarding the card, contact MDR at mdr@msu.edu or 517-353-4570.
RFID Requirements for Michigan Cattle
New Web Site Available

As of March 1, 2007, all cattle must be identified with an official radio frequency identification (RFID) ear tag prior to movement from a Michigan premises. A new website serves as a source of information regarding the mandatory program.

www.michigananimalid.com

The website includes details about obtaining a national premises identification number and ordering RFID ear tags. You can also access information about how to apply and manage the RFID tags to prevent loss of the tags from the animals’ ears. Useful links to related information also are available.

Don’t delay in ordering a supply of RFID ear tags for your operation. Be sure you are ready for the new requirements on March 1, 2007.

COMBINE WINTER FUN WITH A DAIRY EDUCATION

Join dairy industry members from across the Midwest as they converge on Michigan’s favorite family destination for the region’s premier educational conference.

The 5th Annual Great Lakes Regional Dairy Conference
February 8-10, 2007
Frankenmuth, Mich.

- Meet 2000 Olympic Gold Medal wrestler Rulon Gardner
- Interact with producer panels
- Learn how to raise quality heifers from Pat Hoffman, University of Wisconsin
- Hear tips on improving milk quality from Ron Erskine, Michigan State University
- See the premier of the Spartan 3 Dairy Ration Program

To learn more about the GLRDC, visit www.glrdc.msu.edu or call (989) 834-9656 or (616) 293-3189.
Calendar of Events
Autumn & Winter

Comprehensive Nutrient Management Plan
Training Session
Nov. 7-9, 8am-4:30pm
Holiday Inn
Lima, Ohio
Contact: 269-781-0908, 419-337-9210

MSU Animal Science 100th Anniversary
Nov. 10-11, 9:15am-12:30pm
Michigan State University
http://www.ans.msu.edu for information
http://web2.msue.msu.edu/ans/registration.cfm to register
Contact: Faye Watson, 517-353-3174

Farm it Forward
Jan. 5, 9:30am-5:15pm
Kellogg Biological Station
Hickory Corners
Contact: Van Varner, 248-347-0269.

Agriculture’s Conference on the Environment
Jan. 27
Lansing Center
Lansing
http://www.maeap.org
Contact: Jim Van Arkel, 517-241-2232

Great Lakes Regional Dairy Conference
Feb. 8-10
Frankenmuth
http://www.glrdc.msu.edu
Contact: 989-834-9656, 616-293-3189

An index summarizing all articles published in Michigan Dairy Review in 2006 can be found at www.mdr.msu.edu

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