The U.S. Environmental Protection Agency (EPA) Administrator Christie Whitman has announced that the agency is working with the agricultural community to control water pollution from the nation’s largest livestock operations while keeping American agriculture viable. Whitman, joined by Agriculture Secretary Ann Veneman, announced a final rule that will require all large Concentrated Animal Feeding Operations (CAFOs) to obtain permits that will ensure protection of America’s waters from wastewater and manure. Adherence to the rule will control runoff from agricultural feeding operations.

“This new rule is an historic step forward in our efforts to make America’s waters cleaner and purer,” said Whitman. “It will help reduce what has been a growing problem – the fact that animal waste generated by CAFOs poses an increasing threat to the health of America’s waters. EPA looks forward to continuing to work with USDA and with the broader agricultural community to ensure that the goal we all share — cleaner, purer water — is being advanced by our efforts.”

“The new rule is unique in that it comes after unprecedented cooperation between EPA and USDA to find a way to help livestock producers meet their own and society’s goals for environmental quality and profitability,” said Veneman. “USDA stands ready to provide assistance in an incentive-based approach combining information and education, research and technology transfer, direct technical assistance and financial assistance through the Environmental Quality Incentives Program (EQIP) and other Farm Bill programs.”

Today’s announcement finalizes a rule that will replace 25-year-old technology requirements and permitting regulations that did not address today’s environmental needs and did not keep pace with growth in the industry. Effective manure management practices required by this rule will maximize the use of manure as a resource for agriculture while reducing potential adverse impacts on the environment.

The new rule applies to about 15,500 livestock operations across the country. Under the new rule all large CAFOs will be required to apply for a permit, submit an annual report, and develop and follow a plan for handling manure and wastewater. In addition, the rule moves efforts to protect the environment forward by: placing controls on land application of manure

EPA, USDA Work Together for Clean Waters

http://www.mdr.msu.edu

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and wastewater, covering all major animal agriculture sectors, and increasing public access to information through CAFO annual reports. The rule also eliminates current permitting exemptions and expands coverage over types of animals in three important ways: the rule eliminates the exemption that excuses CAFOs from applying for permits if they only discharge during large storms; second, the rule eliminates the exemption for operations that raise chickens with dry manure handling systems; and third, the rule extends coverage to immature swine and immature dairy cattle.

Currently about 4,500 operations are covered by permits. Because of the new rule, EPA expects that up to 11,000 additional livestock operations will be required to apply for permits by 2006.

Conforming to the rule will enhance protection of the nation’s waters from nutrient over-enrichment and eutrophication, which causes algal blooms, fish kills and expansion of the Gulf of Mexico dead zone. Implementation of the rule also will reduce pathogens in drinking water and improve coastal water quality.

The new rule will affect large livestock operations, including those with hundreds of thousands of hogs, cattle and poultry. Large CAFOs are defined as operations raising more than 1,000 cattle, 700 dairy cows, 2,500 swine, 10,000 sheep, 125,000 chickens, 82,000 laying hens, and 55,000 turkeys in confinement.

From 1982 to 1997 these large livestock operations have grown by 51 percent, with some of the largest facilities having capacities exceeding a million animals. Since 1978 the number of animals per confined animal operation has increased significantly. The largest per operation increases have been: layers (176%), broilers (148%), swine (134%), turkeys (129%), dairy (93%), and beef cattle (56%).

To help these livestock operations meet the rule’s requirements, Congress increased funding for land and water conservation programs in the 2002 Farm Bill by $20.9 billion, bringing total funding for these programs to $51 billion over the next decade. The EQIP was authorized at $200 million in 2002 and ultimately will go up to $1.3 billion in 2007; 60 percent of those funds must go to livestock operations. New technology also is being developed to aid farmers in meeting this new rule.

States are being given significant flexibility to find geographically appropriate means of implementing the CAFO rule. For example, states retain the authority to determine the type of permit — general or individual — to be issued to a given operation. This enables States to develop permits that take into account the size, location, and environmental risks that may be posed by an operation. States also will have substantial flexibility to tailor nutrient management plans for CAFOs, and may authorize alternative performance standards for existing and new CAFOs that will help promote the use of innovative technologies.

(This article was adapted from a release by the EPA Newsroom on December 15, 2002.)

For more information about the CAFO final rule go to EPA web site: http://cfpub.epa.gov/npdes/afo/cafofinalrule.cfm

Listed here is the 419-page document — 10 chapters plus parts 122 and 412. Particularly useful for dairy producers for first review are five summary brochures also at the web site: CAFO Rule Information Sheet; General Factsheet on the CAFO Final Rule; Will My Operation Be Regulated?; What are the Federal Requirements for Dairy Cattle or Heifer CAFOs?; and, What are the Federal Record-Keeping and Reporting Requirements?

**Manure Management**

**Dairy Producers: Balancing Phosphorus, Your Farm’s Future**

Dave Beede  
Dept. of Animal Science

Balancing phosphorus (P) means that imported P equals exported P on a whole-farm basis (zero P balance). The December 15, 2002, announcement of the Environmental Protection Agency’s final rule for Concentrated Animal Feeding Operations (CAFOs) emphasizes the need for meticulous on-farm P balancing and management. This management starts with accurate input of P to your cows, largely in feed supplements. Typically, imported feed P makes up the majority of imported P to dairy farms (2); the other input is P-containing fertilizer. Both inputs should and must be managed effectively to achieve whole-farm P balance. This article focuses on management of feed P inputs.

Do you know the recommended levels of P in rations for cows in your herd? You should! You should know this like you know how much milk you shipped yesterday or what your mailbox milk price was last month! Consider the following when balancing P for your farm.

**Phosphorus Balancing**

Recent surveys indicate that in many midwestern dairy farms: 1) P inputs often are greater than outputs; 2) when inputs are greater than outputs, P builds-up in soil over time; 3) the potential for P runoff increases when soil P builds up to
excessive levels; and, 4) P in runoff causes oxygen debt killing aquatic life and excessive algae growth reducing water quality of streams and lakes (1). This is not sustainable — environmentally or legally. Being sure that total P inputs (imports) are less than or equal to total P outputs (exports) is crucial to survival (Figure 1).

Additionally, P balancing is important to:

1) PROFITS — your profits will be reduced considerably when more P is purchased than your cows and farm need; and,

2) REGULATIONS — your farm may be subject to the CAFO final rule (page 1 of this issue). And, even if your operation does not fall under CAFO definitions, having excess P in manure and in soil will limit greatly your management options over time to meet Michigan Department of Agriculture’s Generally Accepted Agricultural and Management Practices (MDA’s GAAMPs) guidelines (3).

Optimizing Ration Phosphorus

How can you, your nutritionist, and your feed supplier optimize ration P? Firstly, you as the dairy producer are the manager and ultimately in charge of and responsible for your rations’ P levels, not your nutritionist. Secondly, matching ration P content (%) to milk production level is critical. Use the new National Research Council’s 2001 feeding recommendations (examples are in Table 1; 4). Note that the highest concentration required for high producing cows is only 0.38%, dry basis!

Thirdly, analyze your feeds. Talk with your nutritionist and use a qualified laboratory to determine P contents of feed ingredients and adjust your inputs and rations as necessary. “Book values” for P content of feeds will not give you the management accuracy needed. Many feed ingredients, especially byproduct feeds resulting from wet- or dry-processing or fermentation (e.g., distiller’s grain), have variable P contents or values different from the book. Also, to have reliable information for your P balancing, laboratory analysis must be done by the wet chemistry method, instead of NIRS (near infrared reflectance spectroscopy). NIRS gives inaccurate estimates of actual P concentrations of most feeds.

Purchasing Phosphorus Supplements

You may be purchasing (importing) supplements mainly for their protein, but did you know that they also contain varying amounts of P? Table 2 gives you ‘ballpark’ P and crude protein levels of some common protein sources and byproduct feeds. Most of these contain high concentrations of P.

Are you adding a supplement that you might not need? Review your rations carefully. You might be able to reduce costs by eliminating unneeded supplements! Or, are you including a supplement that contributes to more total ration P than is needed by your cows? In many of our midwestern dairy rations, very little if any, supplemental P is needed. In most cases, the primary objective of a supplement is to provide protein, not P. Therefore, using protein sources with higher crude protein-to-phosphorus ratios will provide more of the needed protein with less P (e.g., blood meal, corn gluten meal, and soybean meal; Table 2). Actually, using protein sources or byproduct feeds that supply more P than needed in the ration (those with lower crude protein-to-phosphorus ratios; Table 2) may cost you even more money in the long run (see page 5).

Lower Ration P, Lowers Manure P, and Acres

Lowering dietary P to recommended levels automatically will lower manure P (Table 3). Consequently fewer acres will be needed to spread manure.
Without accurate management control of ration P levels, more acreage will be required. For example, in a 100-cow dairy farm, if ration P was lowered from 0.55% to 0.38%, the amount of land needed to spread manure would be reduced by 110 acres annually (Table 3). If ration P levels are not lowered to NRC recommendations (4) and your operation is subject to the new CAFO final rule, you will need more acres on which to spread manure. Even if your farm does not fall under the new CAFO rule, the land needed to follow the MDA's GAAMPs guidelines based on P balancing will be much less by feeding at NRC recommendations (4).

**Summary**

Managing P inputs and outputs to achieve zero whole-farm P balance (Figure 1) must be a primary goal of dairy operations to control costs, achieve excellent environmental stewardship, and to be in compliance (legal) under the new CAFO rule and (or) MDA's GAAMPs guidelines (3). Balancing for P is achievable when dairy producers effectively manage P inputs through accurate feeding and if sufficient land base is available to spread manure P. Ration P levels in excess of those needed to meet cows’ needs result in excess manure P. Using imported feeds (supplements) with lower P levels will help reduce P in manure. The buck stops with the dairy owner or manager for effective P management. But, P balancing is achievable if feed P inputs are controlled and managed carefully and effectively.

### Table 2. Phosphorus (P) and crude protein (CP) contents of protein sources and byproduct feeds.

<table>
<thead>
<tr>
<th>Protein sources and byproduct feeds</th>
<th>Phosphorus content (%)</th>
<th>Crude protein content (%)</th>
<th>CP-to-P ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood meal</td>
<td>0.30</td>
<td>95.5</td>
<td>318</td>
</tr>
<tr>
<td>Corn gluten meal</td>
<td>0.60</td>
<td>65.0</td>
<td>108</td>
</tr>
<tr>
<td>Soybean meal (44%CP; expeller)</td>
<td>0.70</td>
<td>49.9</td>
<td>71</td>
</tr>
<tr>
<td>Brewer’s grain (dried)</td>
<td>0.67</td>
<td>29.2</td>
<td>44</td>
</tr>
<tr>
<td>Cottonseed, whole</td>
<td>0.60</td>
<td>23.5</td>
<td>39</td>
</tr>
<tr>
<td>Distiller’s grain, corn (with solubles, dried)</td>
<td>0.83</td>
<td>29.7</td>
<td>36</td>
</tr>
<tr>
<td>Canola meal (mechanically extracted)</td>
<td>1.10</td>
<td>37.8</td>
<td>34</td>
</tr>
<tr>
<td>Corn gluten feed</td>
<td>1.00</td>
<td>23.8</td>
<td>24</td>
</tr>
<tr>
<td>Wheat middlings</td>
<td>1.00</td>
<td>18.5</td>
<td>19</td>
</tr>
<tr>
<td>Corn steep liquor</td>
<td>1.70</td>
<td>33.0</td>
<td>19</td>
</tr>
<tr>
<td>Wheat bran</td>
<td>1.18</td>
<td>17.3</td>
<td>15</td>
</tr>
<tr>
<td>Whey</td>
<td>1.04</td>
<td>14.6</td>
<td>14</td>
</tr>
<tr>
<td>Porcine meat and bone meal</td>
<td>4.73</td>
<td>54.2</td>
<td>12</td>
</tr>
</tbody>
</table>

*Values from NRC (4).
*Refer to sidebar on page 5 for more discussion of the real costs of byproduct feeds when whole-farm P balancing is an important consideration.

### Table 3. Example of relationships among ration P, manure P, and spreadable acres.

<table>
<thead>
<tr>
<th>Relative to recommendations</th>
<th>Ration P (%)</th>
<th>Manure P (lb/ cow/year)</th>
<th>Spreadable acres (per cow/year)</th>
<th>Acres needed /100 cows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exceeds NRC (4) recommendations</td>
<td>0.55</td>
<td>78</td>
<td>2.9</td>
<td>290</td>
</tr>
<tr>
<td></td>
<td>0.48</td>
<td>65</td>
<td>2.4</td>
<td>240</td>
</tr>
<tr>
<td>Within NRC (4) recommendations</td>
<td>0.38</td>
<td>47</td>
<td>1.8</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>0.35</td>
<td>42</td>
<td>1.6</td>
<td>160</td>
</tr>
</tbody>
</table>


### References


*Graphics adapted from publications of the University of Wisconsin-Extension and USDA-ARS Dairy Forage Research Center.*
Real Costs of Byproduct Feeds?

The dairy industry has long been a primary user of byproduct feeds resulting from wet- and dry-milling processes, corn syrup production, and distillery and brewery fermentations. Increases in ethanol production in Michigan and the Midwest from corn and other fermentable substrates doubtless will make even more distiller’s byproduct feed available. Distiller’s grain has few other uses except as livestock feed. Traditionally, byproduct feeds have been considered somewhat of a windfall as valuable sources of protein and energy in relation to their market price. Ration formulation programs (least-cost or best-cost formulations) often call for byproducts to be used in rations.

However, it is time to re-think how some byproduct feeds are used in dairy rations. As indicated in the previous article, many of these byproduct feeds contribute significant amounts of phosphorus (P) to rations, sometimes in excess of cows’ needs. Often Michigan dairy rations with significant amounts of byproduct feeds, with no P from mineral supplements/packs, have P levels well in excess of cows’ needs. Excess ration P results in excess manure P.

There are costs associated with this excess manure P—more land needed to spread extra manure P, more processing to sequester and remove excess manure P (see next article), or other costs associated with handling and exporting excess P from the farm.

For sound economics and environmental management, these additional costs, which are the real costs of extra manure P handling and disposal, associated with some byproduct feeds containing considerable P should be reflected in the feeds’ prices in ration formulations. That is their real cost in whole-farm P balancing. What that real price should be is a difficult question to answer. Doubtless, the true extra cost of excess manure P likely is very farm-dependent. For example, if more land had to be purchased to spread that excess manure P associated with feeding byproducts, then the extra cost associated with that excess P somehow should be computed considering cost of the extra land needed to deal with the excess P. Another approach if land is not available might be to determine the actual costs associated with export (disposal) of excess manure P and appropriately increase the price of the byproduct feed in ration formulation. Then one would know when it is not cost-effective to include a particular byproduct feed in the ration; or, at least one would understand that there was going to be an extra cost associated with disposing of excess manure P associated with feeding of that byproduct to maintain P balance in the whole farm.

For many years the livestock industry and especially the dairy industry has been the “dumping ground” for excess P generated by the food, beverage, and fermentation industries through their byproducts. In effect, the dairy industry has been given the responsibility (environmental and financial) of managing someone else’s excess P. One way to see that this is done equitably in the future is to put the appropriate higher price on each ton of high-P feed byproduct used in dairy ration formulations. When there are extra costs to dairy farmers associated with managing the excess P, it should be reflected in the price of that feed ingredient in ration formulation. Ultimately, dairy producers should set the real demand for each particular high-P feed byproduct based on real costs. If ration P is in excess of that absolutely needed by cows, manure P increases and extra costs will be incurred. To use the ingredient in rations ultimately increases costs. The real costs of high-P byproducts are greater than we have traditionally thought as “good value” feeds.

Feed for thought and action — Dave Beede.

Chemical Separation of Phosphorus from Liquid Dairy Manure

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Michigan sits at the heart of the Great Lakes region, which contains approximately 20% of the world’s fresh water supply. The cool climate and large urban centers of the region combined with an ample supply of forages and fresh water have fueled a recent boom in the dairy industry of the region. The five state region—Michigan, Wisconsin, Illinois, Indiana, and Ohio—accounts for 22.4% of the annual national fluid milk production according to 2001 USDA statistics. The combination of environmental sensitivity and increasing dairy farm productivity have brought the topic of nutrient management to the forefront.

Objectives
Dairy cows produce large quantities of two fluid products, milk and manure. The ratio of manure to milk production is typically on the order of 2 to 1 on a volume basis. MidWest Plan Service (2000) states that a lactating cow produces...
approximately 18 gallons of manure per day, not including bedding. Contained in that manure stream are large amounts of nutrients (nitrogen [N], phosphorus [P], and potassium [K]). Those nutrients if not properly managed can become ground- and surface-water pollutants. With this in mind, a group of researchers from the Agricultural Engineering and Environmental Engineering Departments at Michigan State University set out to investigate alternative manure treatments. One such project explored the use of chemical coagulants to separate P from liquid dairy manure.

Chemical P precipitation is an advanced treatment technology used in municipal and industrial wastewater plants to separate P from the effluent stream. The goal of this project was to adapt chemical P precipitation used in the treatment of municipal wastewater to treat liquid dairy manure and reduce the P concentration of liquid dairy manure by 80%.

The Michigan Animal Agriculture Initiative and Michigan Agricultural Experiment Station jointly funded the chemical separation project.

First, liquid dairy manure was characterized. Properties including total P, soluble P, chemical oxygen demand, total solids, volatile solids, and pH were determined.

### Characterizing Manure

Establishing values for the liquid manure properties allowed the range of chemical treatment doses to be narrowed. Furthermore, the experimental results obtained later could be compared with the established baseline manure properties obtained during the characterization process.

The liquid dairy manure used in the chemical coagulation experiments had been processed by a sand-manure separator followed by a solid–liquid separation system. Processed manure was selected because it contained less fibrous material and grit, both known to hinder the precipitation and settling of the P in the manure.

Three chemical coagulants (lime, alum, and ferric chloride) were used to treat the dairy manure. Laboratory testing of the chemical additives was based on the standard jar test procedure used in the municipal wastewater industry. Jar tests involve three steps: i) precipitation, ii) flocculation, and iii) settling.

Figure 1 depicts the stages observed during jar test experiments. First, a measured amount of untreated liquid dairy manure (one liter) was added to each jar. Following addition of chemical additives, the solutions were mechanically mixed at 100 rpm using a jar test apparatus. Mixing continued throughout the precipitation and flocculation steps to increase particle interaction. Binding of the chemical coagulant with P occurred in the precipitation phase. The negatively charged phosphate ions were attracted to the positively charged chemical coagulants. During flocculation, precipitated phosphate particles aggregated into large dense masses known as “flocs”. Finally, each mixture was allowed to settle, undisturbed, for 24 hours. Samples for analysis were drawn from the liquid fraction at 1 and 24 hours after the onset of settling and were analyzed for soluble and total P.

A summary of liquid dairy manure properties is presented in Table 1. The liquid dairy manure is a dilute mixture containing only 2.85% total solids. Dilution occurred in the sand-manure separator where scraped dairy manure was mixed in a 1-to-1 ratio with effluent from the solid-liquid separator. The solid-liquid separator removed approximately 35% of the total solids. Liquid manure for treatment was collected from the discharge of the solid-liquid separator.

Because the dilution water was recycled liquid manure, the biochemical oxygen demand, chemical oxygen demand, and total P were not significantly altered during the processing in the sand-manure separator. Table 2 compares municipal wastewater with typical “as excreted” dairy manure and with the liquid manure used in this project. Municipal wastewater is considered a very low strength dilute waste. On the other hand, dairy manure is a high strength stream, with nutrient levels typically two orders of magnitude higher than municipal waste.

### Chemical Treatment

The chemicals tested during the project included hydrated lime, a 40% alum solution, and a 40% ferric chloride solution. These chemicals are commonly used to treat municipal wastewater for P removal. Preliminary experiments established the five treatment doses for each chemical that would be used.
in replicated experiments. As described earlier, the separation of the \( \text{P} \) occurred during a 24-hour period of passive settling that followed precipitation and flocculation. During the settling phase, two distinct volumes emerged, a liquid fraction and a sludge fraction. It is important to note that the \( \text{P} \) separation data presented in this article are based on the reduction of \( \text{P} \) in the liquid fraction (or the concentrations of \( \text{P} \) in the settled sludge).

A summary of the results from jar tests where lime was used as the coagulant is shown in Table 3. For each of the five treatment doses, the estimated treatment cost and the soluble and total \( \text{P} \) reductions are presented for 1 hour and 24 hours of settling. Soluble and total \( \text{P} \) separation improved as the dose of lime increased after 1 hour of settling. However, the effect of dose was not realized after 24 hours of settling. Liquid fraction \( \text{P} \) reductions where lime was used as the coagulant tended to peak at about 80% for soluble \( \text{P} \) and 70% for total \( \text{P} \) after 24 hours of settling.

The second chemical evaluated was liquid alum. Again, a summary of the results from experiments where alum was used as the coagulant is included in Table 4. Alum proved to be more efficient at binding and settling \( \text{P} \) when compared with lime. After only 1 hour of settling, soluble and total \( \text{P} \) reductions reached as high as 100% and 82%, respectively. Continuing the settling for 24 hours improved the reductions in both soluble and total \( \text{P} \). Increasing treatment dose improved the reductions of \( \text{P} \) in both the 1- and 24-hour samples. The reason for the improved \( \text{P} \) reduction seen with the alum (and also with ferric chloride) compared with lime is due to the extra charge on the metal ions. Alum and ferric chloride both carry +3 charges, whereas lime has a +2 charge. According to the Schulz-Hardy rule with each additional charge on the chemical additive, there is a 10-fold increase in coagulation ability.

Ferric chloride was the last chemical used to treat the liquid dairy manure for \( \text{P} \) separation. Table 5
### Table 5. Phosphorus concentration reductions using ferric chloride.

<table>
<thead>
<tr>
<th>Dosage (g/L)</th>
<th>Treatment cost ($/1000 gal)</th>
<th>Concentration reductions (%)</th>
<th>1 Hour</th>
<th>24 Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Soluble phosphorus</td>
<td>Total phosphorus</td>
<td>Soluble phosphorus</td>
<td>Total phosphorus</td>
</tr>
<tr>
<td>0.80</td>
<td>2.42</td>
<td>43</td>
<td>33</td>
<td>79</td>
</tr>
<tr>
<td>2.00</td>
<td>6.05</td>
<td>53</td>
<td>25</td>
<td>79</td>
</tr>
<tr>
<td>4.00</td>
<td>12.10</td>
<td>66</td>
<td>32</td>
<td>81</td>
</tr>
<tr>
<td>6.00</td>
<td>18.14</td>
<td>102</td>
<td>66</td>
<td>99</td>
</tr>
<tr>
<td>8.00</td>
<td>24.19</td>
<td>105</td>
<td>74</td>
<td>104</td>
</tr>
</tbody>
</table>

*Reductions in phosphorus in the liquid fraction using the jar test.*

contains a summary of the results. Similar to alum, high treatment levels of ferric chloride bound soluble P very effectively, achieving 100% separation after 1 hour of settling. Unlike lime or alum, P separation using ferric chloride did not improve stepwise as dose increased. The 6 and 8 g/L doses showed marked improvements in the separation of soluble P at both sampling times. Ferric chloride did not perform as well at separating total P, as did alum, especially in the 24-h samples.

In the laboratory tests, all chemical additives achieved the goal of an 80% reduction of soluble P in the liquid fraction. Alum and ferric chloride also reduced total P by 80% in the liquid. Based on the results of this project, alum appears to be the most likely option for chemically treating liquid dairy manure for P separation. Lime is the least expensive, but it is difficult to handle and may require extra equipment. Ferric chloride, on the other hand, is probably too expensive to serve as the sole coagulant of P in liquid dairy manure.

### Summary

Chemical P separation is an example of a wastewater treatment technology that traditionally has been considered unfeasible for treating livestock wastes. Advances in technology and socio-economic pressures are now driving chemical P separation systems. The two commercial systems will process the effluent of sand-manure and solid-liquid separation systems. The chemical P systems will utilize a combination of chemicals including ferric chloride and polymers. Ferric chloride was selected by the company supplying the treatment equipment based on its performance in combination with the polymer. By using a combination of chemicals, higher extents of P separation can be achieved with a lower treatment cost. The goal of the commercial system is to reduce P in the liquid manure fraction by 80 to 90% with a chemical treatment cost of around $30 per cow annually. Flocculated P will be separated via a belt filter press. Additionally, both farms will clarify the effluent from the belt filter press. The producers adopted this technology to reduce labor costs associated with manure application and to better utilize the manure nutrients.

### What is a Discharge and Do You Have One?

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MSU Extension Dairy, Ag. and Natural Resources Agents

**Jan Wilford**  
Michigan Department of Agriculture

Michigan dairy farmers need to be aware of possible negative impacts on the environment. Each and every dairy farm without regard to size or management system generates manure and nutrients. If not properly managed, they may negatively influence the environment. It is imperative that every dairy producer explore opportunities to eliminate existing and reduce the potential for future environmental discharges.

A discharge is the release of nutrients, pathogens, manure, or polluted storm water into surface waters of the state. Surface waters include county drains, ditches, streams, creeks, rivers, wetlands, lakes, and ponds. Based on Right to Farm Generally Accepted Agricultural and Management Practices (GAAMP) for Manure Management and Utilization, it is unacceptable for nutrients, pathogens, manure or polluted storm water to leave the owner’s property.

Look at your farmstead as a stranger would, and consider any potential risk of discharge of nutrients. Consider what happens when there is a hard, high-volume rain. Where does the runoff water from the farmstead go and is it carrying manure and other nutrients with it? Below is a list of points to consider.

1. **Milhouse and/or Parlor Wastewater.**
   - Is milkhouse and parlor wastewater collected and applied to land?
• If not collected and applied to land, is milkhouse and parlor wastewater treated?
  a. Acceptable wastewater treatments may include appropriately sized and designed settling tanks followed by an acceptable filtration system. This does not include a failed septic leach field or a direct tile line to surface water.
  b. Inadequate management and maintenance of treatment systems may pose a discharge threat, particularly if near surface water.
• Is water from a non-contact plate cooler prevented from reaching surface water? If not, you must obtain a non-contact plate cooler water discharge permit from the Michigan Department of Environmental Quality.

2. Silage Leachate and Feed Storage Runoff.
• Does ANY silage leachate or runoff from feed storage and handling areas reach surface waters or form pools on the surface of the ground?

3. Outdoor Lots.
• Does ANY manure- or feed-contaminated runoff from animal housing, traffic, or handling areas reach surface water?

4. Pasturing along Surface Waters.
• Is animal access to streams limited to properly designed animal crossing and watering access points that prevent stream bank erosion?

5. Manure Storage Breaches.
• Are there any evident leaks or overflows from manure storages?
  • Is there evidence of compromised manure storage structures that pose imminent risk of a leak or overflow?

6. Other Potential Nutrient Runoff and Discharge Sources.
• Manure loading and handling areas.
• Composting areas.
• Manure storage and stacking areas.
• Drains from boot washes and other cleaning areas.
• Mortality disposal (Note: Michigan law provides guidelines for disposal of dead animals, including burial and composting restrictions.)

The above list is not comprehensive of all potential discharges, but provides examples to help you begin assessing your farmstead. If you are concerned about a discharge or the potential risk of a discharge on your farm, contact your local Natural Resource Conservation Service, Conservation District, MSU Extension, or qualified professional to develop a Comprehensive Nutrient Management Plan provider.

* In Michigan, Part 31-Water Resources Protection of Public Act 451 of The Natural Resources and Environmental Protection Act states, “A person shall not directly or indirectly discharge into waters of the state a substance that is or may become injurious to any of the following: a) to the public health, b) to domestic, commercial, industrial, agricultural, recreational or other uses that are being made or may be made of such waters, c) to the value or utility of riparian lands, d) to livestock, wild animals, birds, fish, aquatic life, or plants or to the growth propagation, or the growth or propagation thereof be prevented or injuriously affected; or whereby the value of fish and game is or may be destroyed or impaired.

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**Health Management**

Neospora Caninum-induced Abortions

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Branch, Hillsdale, Jackson, and St. Joseph Counties

Dan Grooms  
Dept. of Lg. Animal Clinical Sciences

*Neospora caninum* (Neeaw-spoor-a kay-ni-num) is a recently discovered protozoal parasite recognized as an important cause of abortion in dairy and beef cattle. Neospora abortion typically occurs in mid-gestation (3 to 8 months) and does not appear to be associated with a specific season of the year. Abortion storms may occur with multiple abortions over a period of 1 to 2 months. Often, the aborted fetuses are partially decomposed and usually do not have characteristic gross lesions. Sometimes a fetus becomes infected with neospora but is not aborted. These calves may be born clinically normal or with neurological signs such as weakness and incoordination. The dams typically do not have clinical signs.

**Widespread Exposure Reported**

*N. caninum* induced bovine abortion has been reported worldwide and is considered a major cause of abortion in the U.S., New Zealand and the Netherlands. In California, it is estimated that 20 to 45% of all bovine abortions may be attributable to neosporosis. A recent study from the National Animal Health Monitoring System (NAHMS) indicated that more than 50% of dairy and beef cattle herds evaluated across the United States had at least one animal with serum antibodies to *N. caninum*. This finding suggests widespread exposure to this parasite.

Wild or domestic canids, for example dogs, coyotes and foxes, are the definitive hosts for *Neospora caninum*. 
Definitive hosts may shed large numbers of oocysts (eggs) in their feces. When cattle, sheep, goats, horses, deer and other animals ingest the oocysts, they can become intermediate hosts. Unlike the definitive hosts, intermediate hosts do not shed oocysts and there is no direct transmission between them. However, the parasite can be transmitted vertically from an infected dam to her developing fetus in utero. Vertical transmission, leading to congenitally infected calves, may occur over several generations and is the major factor contributing to the persistence of Neospora in a herd. As adults, congenitally infected calves have a higher incidence of abortion than non-infected calves, particularly during their first pregnancy. They also have a high rate of vertical transmission to their offspring throughout their lives.

**Abortions, Economic Loss Seen**

Abortions, in particular, can be linked to uninfected cattle with Neospora abortion outbreaks. Evidence suggests that most Neospora abortion outbreaks can be linked to uninfected cattle ingesting feed or water contaminated with feces from infected dogs. Keep dogs away from bunkers silos, silage piles, haymows, and grain and commodity bins. Cover feed with plastic, make sure doors are closed on storage facilities when feed is not being mixed, and put up fences to keep dogs and other animals out of storage areas. Be aware that water sources accessible by dogs or other wild canids, such as ponds or wetlands, also could become contaminated with neospora and serve as a reservoir for transmission to cattle.

1. **Prevent access of dogs and other definitive hosts to feed and water sources.** Evidence suggests that most Neospora abortion outbreaks can be linked to uninfected cattle ingesting feed or water contaminated with feces from an infected dog. Keep dogs away from bunkers silos, silage piles, haymows, and grain and commodity bins. Cover feed with plastic, make sure doors are closed on storage facilities when feed is not being mixed, and put up fences to keep dogs and other animals out of storage areas. Be aware that water sources accessible by dogs or other wild canids, such as ponds or wetlands, also could become contaminated with neospora and serve as a reservoir for transmission to cattle.

2. **Clean pens and feed bunks/alleys routinely.** Neospora oocysts (eggs) are not immediately infectious when they are passed in the feces of infected dogs. They must develop for a period of time in the environment before they can infect cattle. Routine cleaning of pens and feeding areas should be sufficient to reduce the risk of neospora transmission from dogs that defecate in these areas.

3. **Dispose of placetas, aborted fetuses and carcasses immediately.** Dogs and cattle can become infected with neospora by eating infected tissues. Remove and dispose properly all aborted fetuses, placentas, and carcasses as soon as possible to prevent cattle, dogs and other wild canids from eating them.

4. **Vaccination.** Recently the USDA granted full approval to a commercial vaccine, Neoguard™ (Intervet), for reduction of abortions caused by Neospora caninum. Efficacy trials have shown the vaccine effectively reduces abortions in cattle initially exposed to Neospora during pregnancy. There is also preliminary data suggesting that the vaccine may prevent vertical transmission from chronically infected cows to their offspring, and field trials are currently underway to substantiate this. The vaccine manufacturer recommends that cows be vaccinated during the first trimester of pregnancy. An initial 5-ml subcutaneous dose is given followed by a second 5-ml dose 3-4 weeks later. Revaccination with two doses is recommended for all subsequent pregnancies.

Vaccinated cows should be seropositive, or have antibodies to neospora. Keep this in mind if you are using serology to make management decisions about neospora in your herd. Before development of the vaccine, one recommendation for controlling neospora was to screen all purchased cattle for antibodies to the parasite prior to bringing them into the herd. This is still an option, but with the vaccine now widely available, it will become important to know if and when the purchased cattle were vaccinated.

**Summary**

There is no silver bullet guaranteed to rid your herd of neospora or prevent it from becoming infected. The vaccine, while a promising tool, is just a part of the solution. It may help, but the best results will only be seen if the other control strategies also are practiced.
Rethinking Clinical Mastitis Therapy

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The course of treatment for clinical mastitis varies greatly from farm to farm. In most large herds (500 cows or more), a cow is separated from the production herd if clinical mastitis is detected by abnormal milk. Abnormal milk is an indication of a problem that can occur with or without swelling and fever. Clinical mastitis is brought to the attention of the herdsman who must make the decision to move the cow and place her on treatment. Unfortunately, this is often the point where treatment decisions are based on experience and opinions rather than good scientific guidelines and protocols. In order to implement an effective clinical protocol, it is useful to determine the cause of infection and to implement a treatment protocol that is specific for that type of infection. This can result in reduced use of antibiotic drugs and fewer days of unsalable milk.

Objectives of our work were:
• to design a treatment protocol for clinical mastitis;
• to determine the causative organisms of clinical mastitis; and,
• to implement the protocol and measure its success.

Methods Used.

A large commercial dairy located in central Michigan milking 3200 cows twice a day with excellent facilities was enrolled in a clinical mastitis treatment project. This study took place from October 2001 to May 2002.

Standard Farm Mastitis Therapy Protocol. All cows with clinical mastitis were identified and separated from the herd and treated with intramammary antibiotic. Infected quarters were treated with amoxicillin (Amoximast®) twice a day for 3 days. If the milk appeared normal, the cow remained in the mastitis pen until the end of the withholding time. If abnormal milk was still present after 3 days, amoxicillin therapy was continued for another 2 days. Unresponsive quarters were re-evaluated and antibiotics changed or deemed untreatable and removed from production.

Culturing Clinical Cows. Milk samples from clinical quarters were collected aseptically and cultured on farm. The milk sample was placed on a standard blood agar with 1% esculin and MacConkey agar plates. All streptococcal organisms were identified to confirm the presence of Streptococcus agalactiae. Staphylococcus aureus was confirmed using a coagulase test. Coliforms were isolated on MacConkey agar and Enterobacteria coli and Klebsiella sp were identified by lactose fermentation, bile salt precipitation, and other colony characteristics.

Treatment Protocol. Starting in October of 2001, clinical cases were not treated until after the culture results were entered on the cow’s record in Dairy Comp 305 (Figure 1). If either Escherichia coli or Klebsiella were identified on culture, the cow was marked “No Treat” and the quarter was monitored. All

Large Dairy Veterinary Internship Program

At the Michigan State University College of Veterinary Medicine, the Department of Large Animal Clinical Sciences has developed an internship program for large dairy farm production medicine. This internship program was created as a cooperative agreement between the dairy farms and the MSU Large Animal Veterinary Hospital. During the internship, the students train in the treatment of medical and surgical conditions of individual dairy cattle. The interns receive additional training in the areas of necropsy, microbiology, theriogenology, nutrition, mastitis or epidemiology on MSU’s campus. In addition to developing their clinical skills, the interns learn to analyze and interpret herd health data and work with farm employees and management. These are difficult skills to master and unavailable in most other programs.

Each intern is responsible for identifying and studying a problem or researching a topic relevant to the farm. We have seven veterinarians who are enrolled or have successfully completed the internship program. The above article is a paper from a project that was presented at national meetings. Another paper will be printed in the next issue of the Michigan Dairy Review. The goals of the Large Dairy Veterinary Internship are to acquire experience and expertise in food animal medicine and surgery on large dairy herds and to develop an understanding of disease control, biosecurity, nutritional evaluation, calf management, and reproductive health management as encountered on large dairies.

References
others were marked “TREAT” and started on antibiotic therapy. In early February, half of the cows that cultured “no growth” were removed from the treatment group while the other half continued the routine treatment protocol. The groups were compared for return to normal milk, days out of production, and quarter loss.

Results
The majority of clinical cases occurred in the first 100 days of lactation with peaks at 25 days and 75 days for Gram-negative bacteria (E. coli and Klebsiella sp.) infections (Figure 2). The greatest number (28%) Gram-positive bacteria infections (Strep sp. and Staph sp.) were cultured in the first 25 days with the remaining infections occurring throughout lactation.

In February, when the treatment protocol was changed to limit antibiotic therapy to cows that were culture-positive for Gram-positive bacteria, the number of cows requiring intramammary antibiotics was reduced 80%. Fifty-five percent of the clinical quarters cultured “no growth” and 25% cultured Gram-negative bacteria that did not require intramammary antibiotic (Figure 3). Very few cows with clinical cases of mastitis were ill or had a fever that required immediate attention. When treatment was withheld for 24 hours awaiting the culture results, most clinical signs had resolved and the Gram-negative and “no growth” quarters did not require treatment. Cows assigned to treatment in the “no growth” category did not return to normal milk quicker and did not have fewer quarters lost.

Summary
In this study, cows with clinical mastitis that cultured positive for E. coli or “no growth” did not benefit from treatment with intramammary antibiotics and milk was deemed unsalable for longer periods due to milk withdrawal requirements. Currently, these cows with clinical mastitis are identified by culture and monitored for fever. They do not receive antibiotic treatment and

Figure 1. Steps for a clinical mastitis decision; abbreviations = Strep ag (Streptococcus agalactiae); Strep sp (Streptococcus species, other than agalactiae); Staph aureus (Staphylococcus aureus); and, Staph sp (Staphylococcus species).

Figure 2. Days in milk distribution of clinical mastitis.

All cases vs. Gram Negative vs. Gram Positive vs. Negative.
are returned to the milking herd when milk is observed normal. Only cows that have cultured streptococcal and staphylococcal intramammary infections are treated with antibiotics. Change in treatment protocol has increased mastitis monitoring, reduced the lost days of production and decreased the amount of antibiotic used without jeopardizing the animal’s health and well-being.

Employee Management

The I-9 Employment Eligibility Verification Form

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Southeast Michigan

Eileen, owner and manager of Rainbow Dairy, had an employee quit 3 weeks ago. She thought he was going to be trouble, and she was right. He was difficult to get along with and was not doing such a great job either. Yesterday, Eileen received a call from the Immigration and Naturalization Service (INS) stating that she needs to have her I-9 forms ready for inspection within 3 days. What has happened? The ex-employee has filed a complaint stating that ineligible employees were hired at Rainbow Dairy. Upon checking her personnel files she found several I-9 forms missing. They might have been misplaced, possibly by her niece who had often helped out during the hiring process. Eileen wants to know what her responsibilities are and what she should expect.

Employers are required to have an I-9 form on file for every employee hired after November 6, 1986. Every employee includes short-term employees, employees who are citizens, and employees who work for just food and lodging or similar remuneration. This also includes family member employees. The I-9 forms need to be kept for 3 years after the day of hire or 1 year after termination, whichever is longer. It is recommended that I-9 forms be stored separately from personnel files. Technically, INS owns the original records and can ask employers to make them available within 3 days.

Employers often make errors completing I-9 forms, nevertheless it is not particularly difficult to complete them correctly. The form consists of three sections. Section 1 needs to be filled out by the employee upon starting work. The employer is responsible for ensuring that all employees complete section 1 in full. In particular, employees must indicate their status (citizen of the U.S., lawful permanent resident, or work-eligible alien) and sign and date this section. Although employers may not ask for any verification on information provided in section 1, they may help their employees with completing the form. They also would then need to complete and sign the preparer/translator block – the I-9 form is available in English only.

The employer or a trusted agent must complete Section 2 of the I-9 form within 3 business days of the date employment begins. Section 2 deals with the employer’s review and verification of the employee’s eligibility for work in the U.S. For this process the employer needs to ask the employee for documentation. The back of the I-9 form has a list of the three types of documentation required. An employer may not ask for any specific documentation. They should accept any document from list A or any combination of documents from list B and list C. Asking for specific documentation or additional documentation is considered discriminatory and may be a finable offense.

Figure 3. Findings from clinical mastitis culture results (n=496); abbreviations = Strep ag (Streptococcus agalactiae); Strep sp. (Streptococcus species, not agalactiae); Staph sp. (Staphylococcus species, not aureus); E. coli (Eschericha coli) and Klebsiella (Klebsiella species).
Here are some frequently asked questions regarding the I-9 forms.

**Q. What is the employer’s responsibility for this documentation?**

**A.** The employer must examine the document(s) presented to determine if they appear to be genuine and accurately represent the employee. If the documents do not meet these criteria then the employer should reject them and terminate the employee in question. Employers can accept only original documents, no photocopies, except for certified birth certificates. In some cases, the employee can submit receipts showing that they have applied for replacement documentation, which must then be presented to the employer within 90 days. After completing section 2 in full, the employer must sign and date the form. Copying employees’ documentation and attaching them to form I-9 is permissible, but not required. If employers decide to use this practice, it must be done consistently for every employee, regardless of citizenship or national origin.

**Q. What happens if the work authorization expires at some point in the future?**

**A.** Employers must require their employees to maintain work eligibility by renewing an expiring work authorization status indicated in section 1 or the expiring work authorization documents provided for section 2. Re-verification of identity is not required, even if established by a document bearing an expiration date. Section 3 of the I-9 form (or a new form attached to the original one) must be completed by the employer no later than the work authorization expiration date. The employee can present any currently valid document from list A or list C at that time. Again, employers may not ask for a specific document. Resident Alien Cards (“Green Cards”) do not require re-verification because the status does not expire even though the cards do.

**Q. What can an employer do if it is discovered that an I-9 form is not on file or missing for a given employee?**

**A.** It is recommended that the employee be requested to complete an I-9 form as soon as possible and submit the appropriate documentation for section 2. The new form should, however, not be post-dated. A note attached to a late I-9 form provides a record of a good faith effort by the employer. But if an employee is not able to provide documentation at that time, the employer then is assumed to be aware of the individual’s ineligibility to work. If this is discovered, potentially penalties may apply for “knowingly” continuing to employ the person.

**Q. What should an employer do when it is discovered that an employee was not actually authorized to work?**

**A.** The employer cannot knowingly continue to employ the individual. Knowing includes not only actual knowledge, but also knowledge that may be inferred through notice of certain facts or circumstances -- “constructive knowledge.” For example, when an employer fails to complete or improperly completes the I-9 form this may be interpreted as knowledge about an employee’s ineligibility to work in the U.S. Once it is discovered that the individual is in violation, the employer loses the good faith defense against sanction penalties for knowingly hiring an unauthorized alien. Therefore, it is recommended that the employee be terminated. However, the employee should first be given an opportunity to provide acceptable documentation. If false documentation is discovered because the employee who initially presented the documents has subsequently obtained proper authorization and presents new documentation, the employer is not required by immigration law to terminate the employee. Still, an employer’s personnel policy regarding provision of false information may apply to this situation.

Penalties can range from $250 to $2,000 for each unauthorized individual hired; after a previous violation the fine can jump to $10,000 for each individual. A pattern or practice of violation can lead to criminal penalties, including imprisonment. For paperwork violations, such as unchecked boxes in section 1, an employer may still face fines of $100 to $1,000 per form. Periodic reviews or self-audits of I-9 forms to ensure compliance are recommended. The INS usually honors a “good faith” effort.

**Please Note:**

The above information has been compiled from the “Handbook for Employers: Instructions for Completing Form I-9” of 1991 and Internet postings by Federal government agencies and other sources as of July 2002. It is a reference for general educational use. It does not constitute legal advice and the publisher assumes no liability for actions taken based on the information provided. It is the employer’s responsibility to keep abreast of current laws and changes.

People within the dairy industry sometimes ask what dairy farm financial factors change as net farm income changes. This article provides evidence from 2001 associated with four income level groups using whole farm financial results from 154 Michigan dairy farms. Each farm completed balance sheets at the start and at the end of 2001 plus an income statement of expenses and returns during the year. After financial reporting, farms were sorted into groups by income level as defined in the first line of Table 1. Averages were then calculated for each group. The second line in the table shows the numbers of farms in each group. The 154 farms completed a business analysis with Michigan State University’s Department of Agricultural Economics. Collection of farm data was supervised by either Michigan State University Extension, Farm Credit System of Wisconsin, or AgriSolutions of East Lansing. Fifty percent or more of gross cash income had to come from a combination of milk and dairy animal sales for a farm to be in the analysis. Farms were located throughout Michigan, from the western Upper Peninsula to the Ohio/Indiana border. All factors were calculated with software from the University of Minnesota’s Center for Farm Financial Management.

Farm Size
The 25 percent of the farms with highest net farm income had the largest average herd size, an average of 266 cows with a standard deviation of 147. However, the lowest 25 percent group had the second largest herd size, 155 cows with a standard deviation of 90. Milk sold per cow had the same pattern across groups. Few financial factors progressed in a linear fashion across the net farm income groups. Dollars of milk sales per cow went up as net farm income went up. The 50 - 75 percent group had an average milk price over 90 cents per cwt higher than the average price for all 154 farms. The ability to more fully meet quality premium incentive levels and thereby get a higher price, were important to a farm’s placing among the groups. Dairy steer sales per cow went down moving across the groups from lower to higher incomes. It appears the higher income groups preferred to specialize in milk production and stayed away from the lower value enterprise of steer raising.

Table 1 presents only those few factors that appeared to change as net farm income changed. A value with parenthesis around it indicates a negative value. Overall, the farms did not exhibit any consistent relationships with the many items not included in Table 1, such as veterinary, medicine, breeding, and repair costs.

**Table 1. Financial factors that vary with net farm income in Michigan in 2001.**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Range in Net Farm Income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low 25%</td>
</tr>
<tr>
<td>Number of farms</td>
<td>38</td>
</tr>
<tr>
<td>Number of cows</td>
<td>155</td>
</tr>
<tr>
<td>Milk sold per cow, lb</td>
<td>19,047</td>
</tr>
<tr>
<td>Dollars per cow:</td>
<td></td>
</tr>
<tr>
<td>Milk sales</td>
<td>2,858</td>
</tr>
<tr>
<td>Dairy steers sold</td>
<td>92</td>
</tr>
<tr>
<td>Gross cash income</td>
<td>3,654</td>
</tr>
<tr>
<td>Purchased feed</td>
<td>801</td>
</tr>
<tr>
<td>Hired labor expense</td>
<td>438</td>
</tr>
<tr>
<td>Real estate taxes</td>
<td>46</td>
</tr>
<tr>
<td>Farm insurance cost</td>
<td>52</td>
</tr>
<tr>
<td>Total cash expense</td>
<td>3,142</td>
</tr>
<tr>
<td>Net cash farm income</td>
<td>512</td>
</tr>
<tr>
<td>Feed inventory change</td>
<td>(110)*</td>
</tr>
<tr>
<td>Prepaid expenses</td>
<td>(18)</td>
</tr>
<tr>
<td>Depreciation expense</td>
<td>(459)</td>
</tr>
<tr>
<td>Net farm income</td>
<td>(71)</td>
</tr>
</tbody>
</table>

*Parenthesis indicates negative value.
Net Farm Income

Net farm income is cash income minus cash expenses with adjustments made for inventory changes. The noncash items of machinery and building depreciation were deducted. Expenses include interest paid, but nothing was deducted for owner or unpaid family labor. Net farm income per cow is shown on the bottom line of Table 1, going from ($71) to $709. Purchased feed is included because it is the largest single cash expense category in a typical financial records system. The two middle income groups had the lowest purchased feed cost per cow, and it appears inversely related to milk per cow. Hired labor per cow increased with net farm income. Real estate taxes and farm insurance expenses per cow went down as net income went up. However, total cash expenses per cow were about the same for the low and the high income groups. The two middle groups apparently had better cost control practices, which resulted in the lowest total cash expenses.

Inventory items of feeds and prepaid expenses were increased going from the lower to the higher the income groups. The high 25 percent had $194 more feed and crop inventory change than did the low 25 percent. Prepaid expenses include seed, fertilizer, concentrate feeds, and diesel fuel supplies. The per cow value change for the other inventory items of market livestock, accounts payable, and accounts receivable was not associated with net farm income level. Depreciation expense is a combination of change in dairy cattle livestock inventories, machinery depreciation, building depreciation, and other farm capital, such as investment in cooperative stock. In this combined category, Table 1 shows the high 25 percent had $211 less expense per cow than did the low 25 percent. The high 25 percent likely kept their machinery and building investments lower, resulting in less depreciation. Also, this group had more cows, and consequently a bigger denominator when doing the per cow calculation.

Summary

Milk sold per cow and milk price achieved appear to be important reasons why farms have differing net farm income levels. Noncash items of feed inventory changes, prepaid supply changes and depreciation expense are other major items that appear related to income level. Real estate taxes and farm insurance expense per cow trended downwards as net income went up. Steer sales went down, and hired labor expense went up, on a per cow basis, as income increased. I found it surprising that no other per cow financial factors appeared to have changed as net farm income level changed. Table 1 and the data behind it do not fully explain why one group of farms lost $71 per cow while another group made $709 per cow.

Michigan Milk Market Update

Christopher Wolf
Dept. of Agricultural Economics

Changes in milk price policies continue to affect farm milk prices. On November 7, a final decision on Class III and Class IV pricing formulas was announced. The decision contained several slight modifications including: increasing the make allowance in the Class III “other solids” formula; changing the yield formula in the Class IV non-fat solids formula; and altering the Class III protein formula to prevent Class III prices from being negatively affected by butter prices. A University of Wisconsin simulation of prices from January, 2001 through November, 2002 using the final pricing rules compared to the actual prices revealed that the combination of lower butterfat and non-fat solids prices decreased Class IV and Class II prices by about 16 cents per hundredweight. Lower butterfat values in combination with higher skim milk prices increased Class III price of 3.5% butterfat by 21 cents.

In other news, the USDA announced a price support tilt that will reduce the market price of non-fat dry milk. The ever-growing government stock of non-fat dry milk necessitated this price tilt. As of August 2002, the government held 1.218 billion pounds of non-fat dry milk, which accounted for 92% of all non-fat milk sold.

Table 1. Milk Income Loss Contract (MILC) Payment Rates.

<table>
<thead>
<tr>
<th>Month</th>
<th>Base</th>
<th>Class I mover</th>
<th>Difference</th>
<th>Payment ($/cwt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec-01</td>
<td>13.69</td>
<td>11.98</td>
<td>1.71</td>
<td>0.7695</td>
</tr>
<tr>
<td>Jan-02</td>
<td>13.69</td>
<td>11.96</td>
<td>1.73</td>
<td>0.7785</td>
</tr>
<tr>
<td>Feb</td>
<td>13.69</td>
<td>11.95</td>
<td>1.74</td>
<td>0.783</td>
</tr>
<tr>
<td>Mar</td>
<td>13.69</td>
<td>11.62</td>
<td>2.07</td>
<td>0.9315</td>
</tr>
<tr>
<td>Apr</td>
<td>13.69</td>
<td>11.47</td>
<td>2.22</td>
<td>0.999</td>
</tr>
<tr>
<td>May</td>
<td>13.69</td>
<td>11.26</td>
<td>2.43</td>
<td>1.0935</td>
</tr>
<tr>
<td>Jun</td>
<td>13.69</td>
<td>11.03</td>
<td>2.66</td>
<td>1.197</td>
</tr>
<tr>
<td>Jul</td>
<td>13.69</td>
<td>10.62</td>
<td>3.07</td>
<td>1.3815</td>
</tr>
<tr>
<td>Aug</td>
<td>13.69</td>
<td>10.48</td>
<td>3.21</td>
<td>1.4445</td>
</tr>
<tr>
<td>Sept</td>
<td>13.69</td>
<td>10.46</td>
<td>3.23</td>
<td>1.4535</td>
</tr>
<tr>
<td>Oct</td>
<td>13.69</td>
<td>10.15</td>
<td>3.54</td>
<td>1.593</td>
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<tr>
<td>Nov</td>
<td>13.69</td>
<td>10.60</td>
<td>3.09</td>
<td>1.3905</td>
</tr>
<tr>
<td>Dec</td>
<td>13.69</td>
<td>10.52</td>
<td>3.17</td>
<td>1.4265</td>
</tr>
<tr>
<td>Jan-03</td>
<td>13.69</td>
<td>10.56</td>
<td>3.13</td>
<td>1.4085</td>
</tr>
</tbody>
</table>
dry milk stocks in the US. Recall that the price support is an open offer to purchase cheese, butter, and non-fat dry milk. The class price minimums are $9.80/cwt for 3.5% fat milk. The Class IV price is supported by a weighted average of butter and non-fat dry milk prices. The non-fat dry milk price support level is above world market prices leading to the growing stockpile. By lowering the support purchase price of non-fat dry milk while increasing the butter support price, the government hopes to slow the increase in the non-fat dry milk stockpile but avoid butter purchases.

**Total Milk Production Strong**

Nationally, total milk production remained strong through the Fall months. Milk prices remained low leading to large Milk Income Loss Contract (MILC) Payments (Table 1; 1). National milk production momentum combined with floundering dairy product consumption leads forecasters to be pessimistic about a significant price recovery before summer. With feed prices tightening margins, the MILC payments may make the cash flow difference some producers require to remain afloat.

Michigan milk production continues to trend up slightly with an essentially constant number of total milk cows (about 300,000) producing more milk per cow. Michigan hay prices increased significantly between October and November to $104/ton according to the Michigan Agricultural Statistics Service. The high hay price combined with $2.60/bushel corn and $5.60/bushel soybeans translates to a Michigan milk-to-feed price ratio down to 2.42 in September. This is the lowest milk-to-feed price ratio in more than 5 years.

**References**


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**Herd Management**

**Should You Kiss Your Cows Goodnight?**

**Ben Bartlett**

MSU Extension Dairy Agent

Upper Peninsula

If you were “married” to your cows, would they be filing for divorce? I am sure there are times when you have wanted out of the cow business, but have you ever considered your cows’ perspective? If you have read any farm magazines or listened to the news in the last 6 months, it’s obvious that both the public and the dairy industry are very interested in animal welfare. Given the current increase in interest for cow comfort and improved animal handling techniques, I thought it would be interesting to “eavesdrop” on some cow conversations. Are your cows thinking positive things about their current state of affairs or are they thinking “divorce”? (Disclaimer: The following comments may not reflect your cows’ opinions. Your best bet would be to ask your cows yourself).

As we pick up the conversation of Bossie and Bessie, Bos and Bes for short, Bos says:

“I am so stressed out! The new milker, Sammy, is driving me up a wall, literally. I am not eating right, getting my needed rest, and I’m scared to death to go into the milking parlor with him.”

**From A Cow’s Perspective**

Bes says: “Well the stress is not all in your head. Researcher Jeff Rushen from Quebec, did research and found that your milk production could be down 10% if Sammy was in the parlor, and he doesn’t even have to be doing the milking (1). What’s worse is that Sammy has us all on edge. Have you noticed how milking is taking longer? We are all stepping around and kicking off the milking machines more often. To make the situation worse, the owner is getting uptight because milking is taking longer, and now she is doing more yelling. Researcher Ed Pajor of Purdue found that yelling is as adverse to cattle as using a hot shot (2). It sure has gotten more stressful around here.”

Bos replies, “What I can’t believe is that Sammy is supposed to be a trained milker! He doesn’t know anything about working around us cows. You would think the owner would put all new employees through a training program on animal handling. People should notice that we have our eyes on the sides of our face, and we can see over 300 degrees, but we have very poor depth perception.”

“Yea”, says Bes, “Why can’t they just give us a second or so to look over where we are going and not be in such a hurry all the time. It was okay for the owner to slow down when she got bifocals, but we are suppose to run everywhere even if we can’t see our feet”.

“My pet peeve is the noise. Sammy is always yelling and hollering” says Bos. “He can’t wait a few seconds for me to walk into the parlor. He gets right behind me where I can’t see him and starts screaming and pushing. And then he is surprised when I kick. I don’t think Sammy appreciates tailgating by another car when he is driving”.

Bes chimes in, “No one ever tells us anything. I just hate it when things are new or novel and people won’t give us time to sort it out. How are we suppose to know if it’s dangerous or going to hurt us? People should know that cows are creatures of habit and a new gate, a coat hanging on the fence, or anything new takes us a few positive experiences to be comfortable with it”.

Bos says, “If profit margins are down, I sure don’t
understand some things people do. That new heifer, Betty, just calved the other day. I hear they paid $2000 for her and she had never been in a milking parlor before. Three people hollered and pushed her into the parlor and then slapped a ‘can’t kick’ and a milker on her. Researcher Kate Breuer from Australia found that first lactation cows that were hit or rushed into and out of a parlor produced 3 pounds less milk per day compared with more gently handled cows (3). Betty is so afraid that I don’t think she will last even one whole lactation. She is so afraid of people that she slipped and fell three times when they sorted her out for a postcalving check. It’s sad, a great heifer with all that potential and people don’t have time to make her first experience in a parlor a positive one”.

“Bes, if you could talk to dairy farmers, what would you tell them?” asked Bos.

Bes replied “The first thing would be, handling cows more gently will make them more milk and more money. Researcher Hemsworth from Australia did a study with 14 dairy farms and measured fearfulness in cows. He found that 30 to 50% of the variance in milk production among farms could be explained by the level of fear shown by the cows to humans (4). Researcher Seabrook found that in a study of 12 very similar farms that a change in stockman could change production by over 1250 pounds of milk per cow per year (5). Gentle handling pays.”

Bos asked “That’s great for the dairy producer but what about us? How can farmers do things ‘more gently’?”

Bes replied, “We could tell them lots of things, but they are so busy they will just forget. Gentle cattle handling boils down to having knowledge of cow behavior, practicing good handling skills, and having and maintaining adequate facilities. Cows see and hear differently than people. We are prey animals, and people are predators to us. We need to learn not to fear humans. Hollering, hitting, and doing things in a hurry only increase our fear of humans. Cows are creatures of habit. People should just give us a kind word and a gentle stroke when we are calves and treat us with understanding and respect. We do pay the bills after all, and we could work as a team. Gentle handling can benefit both the dairy producers and cows”.

Cows don’t need a kiss goodnight. If dairy farmers and their helpers would just remember, Slow and Quiet, it would be a great first step to building a better relationship. It also could decrease the divorce rate.

References
Table 1. Conception rates (%) of 427 lactating dairy cows divided by average milk production and lactation number when inseminated between 65 and 71 days in lactation.

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<tr>
<th>Lactation Number</th>
<th>Milk production*</th>
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<tr>
<td></td>
<td>Above average</td>
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<tr>
<td>First</td>
<td>59.7*</td>
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<tr>
<td>Second</td>
<td>35.6</td>
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<tr>
<td>Third+</td>
<td>42.4*</td>
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<tr>
<td>All Cows</td>
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*Data grouped by peak daily milk production above the parity mean (above average) or below parity mean (below average). First lactation: < 75 pounds/day = above and ≥ 75 pounds/day = below. Second lactation: < 109 pounds/day = above and ≥ 109 pounds/day = below. Third+ lactation: < 110 pounds/day = above and ≥ 110 pounds/day = below.

A number of dairy herds have had reproductive disorders that may be too fat or too thin at that time. To look at the relationship between milk production and reproduction, we divided the entire group based on average daily milk production per cow from data collected on the nearest test day. Artificial insemination (AI) was performed within 2 weeks of a test day. All data were from 1st inseminations between 65 and 71 days in lactation. The bottom line: Cows with above average milk production had better conception rates than cows below average production (Table 1). Why? Most likely because they were healthier, and most likely because more of the cows in the below average group may have had a health-related problem either at calving or in early lactation.

**Reproductive Disorders**

Reproduction can affect annual herd milk production in two ways. 1) reproductive disorders may decrease peak milk yield; and, 2) reproductive inefficiencies such as poor detection of estrus and conception rates extend lactation, dry period, and calving interval.

Reproductive disorders that may reduce peak milk production include: twinning, stillbirth, dystocia (difficult births), retained placenta, metritis, and pyometra (uterine infection). Even cows with ketosis and displaced abomasums have a greater chance of having a uterine infection (1).

Of these disorders, twinning may have the most profound effect on subsequent milk production and reproductive performance. Cows that have twins have a greater likelihood of retained placenta, metritis, pyometra, a reduction in peak milk, and a greater potential for breeding problems (1,2).

A number of dairy herds have had a substantial increase in twins over the past few years. Data from Wisconsin suggest that increased twinning is tied to an increase in milk production via an increase in double ovulations. Some of the problems associated with twinning can be minimized by intensifying the management of cows carrying twins. Thus, preparing cows carrying twins for the subsequent lactation is of paramount importance. Knowing which cows are pregnant with twins is obviously important. If your veterinarian is not already looking for twins at pregnancy diagnosis, this may be something you will want to request. A number of veterinarians are using ultrasound with a 5 MHz transducer for pregnancy diagnosis for greater accuracy of diagnosis, and because ultrasound allows much easier diagnosis of twins compared with palpating. Right now, there is no way to decrease numbers of double ovulations, but there are a few things that can be done to get these cows off to a better start. Once cows carrying twins are identified, this information can be used to ensure sufficient time in the pre-fresh group (remember cows that have twins usually calve early), to ensure cows are at the ideal body condition score at calving (cows carrying twins are generally too thin at calving), and to ensure the cow will be taken care of properly at the time of calving. Diet and management of bST in late lactation is important not only in cows carrying twins, but in other cows that may be too fat or too thin at that time.

**Here’s A Repro Tip**

Producers can impact dramatically days open and % cows culled for reproductive reasons by implementing two simple strategies for pregnancy diagnosis. First, pregnancy diagnose early and often! If your veterinarian is confident checking cows at 33 d, producers should have a group of cows ready to check on a weekly basis that would be 33 to 39 days since last AI. Yes, I said weekly! Knowing sooner which cows are “open” will help to get these cows pregnant sooner, thus reducing days open.

Second, once a cow is found pregnant the job is not done. We have data indicating that a cow pregnant at 28 days (checked with ultrasound) has a 20% chance of subsequently losing her calf. In fact, she has a 16% chance of losing the calf by 56 days after AI. So, it is imperative that cows pregnant at first diagnosis are checked a second time about 30 days later. So, in reality, don’t think of a pregnancy diagnosis as a pregnancy check. Think of it as an “open check” so that open cows are detected before it is too late!

- Richard Pursley
Disorders that arise from calving difficulties such as metritis and pyometra may sometimes be unavoidable. But, most cases can be avoided by proper cleaning and sanitation of calving pens.

In summary, spend a little of that hard earned money in the form of a gratuity for your cows. Give them the treatment they deserve and in return they will take care of you. Milk production and reproduction go hand in hand. Take care of the management strategies that improve reproduction, and in turn, milk production, cow health, and happiness will be maximized.

Industry & University

Michigan Dairy Heifer Replacement Project, Michigan Dairy Expo

Joe Domecq
Dept. of Animal Science

A new and exciting opportunity for 4-H and FFA members across the state of Michigan is being developed. Youth will have the opportunity to participate in the Michigan Dairy Heifer Replacement Project at Michigan Dairy Expo from July 21-25, 2003. This project will allow youth to learn more about the dairy industry through the selection, raising, breeding, and marketing of dairy heifers. While the primary goal of this project is for each youth to gain dairy knowledge and experience, each youth also will have the opportunity to earn money through the sale of their dairy replacement heifers.

Michigan Dairy Expo will host a sale of replacement dairy heifers owned by youth during the evening of Tuesday, July 22, at the MSU Pavilion. This sale will follow the All Michigan Dairy Youth Show, which is being held earlier that same day.

Dairy producers will have the opportunity to purchase high quality dairy replacement heifers. Listed below are the project guidelines and rules. For additional information, please contact Joe Domecq, Dairy Youth Specialist, at (517)353-7855 or domecqjo@msu.edu.

Youth Eligibility
To meet eligibility requirements, youth:
• must be at least 9 years old and no older than 19 on December 31, 2003;
• must exhibit the heifer in the All Michigan Dairy Youth Show at Michigan Dairy Expo; and,
• may enter two heifers in the project, but may only sell one at Michigan Dairy Expo.

Heifer Selection
The heifer selection guidelines are as follows:
• any dairy breed of heifer is acceptable;
• registered or grade heifers are acceptable;
• the dam of heifer must meet minimum lactation production records, which will be included in the sale catalog (Holstein, 18,000 lb; Jersey, 12,000 lb; Brown Swiss, 16,000 lb; all other dairy breeds, 14,000 lb);
• sire of heifer must be registered; and,
• heifer must be born between June and October of 2001.

Heifer Reproduction and Health
In the area of reproduction and health:
• all animal health requirements must be met to exhibit cattle at Michigan Dairy Expo;
• heifers must be due to calve between September 1 and December 1, 2003;
• heifers must be bred artificially; and,
• all heifers will be checked for pregnancy by a veterinarian at Michigan Dairy Expo prior to sale.

Heifer Enrollment
Heifer enrollment rules are as follows:
• all heifers must be entered by April 15, 2003;
• official entry forms can be obtained from County Extension offices or the State 4-H Dairy Office;
• each entry form will include official identification and a picture of each heifer;
• each entry form will include a short written description of the project by each youth;
• no heifer substitutions will be allowed after April 15, 2003; and,
• if two heifers are entered by one youth, the sale heifer must be selected by June 15, 2003 and the state 4-H Dairy Specialist (Joe Domecq) notified of this selection.

Sale Information
Sale information requirements include:
• all youth and heifers must meet all project requirements to participate in the sale;
• a sale catalog listing youth and heifer information will be prepared;
• sale heifers will be identified at Michigan Dairy Expo with neck chains and stall signs; and,
• sale advertisement will be done across the state of Michigan.

A sale committee of dairy producers, leaders, volunteers, and dairy cattle merchandisers will assist Michigan Dairy Expo conducting the project and sale. Also, a 10% commission on each heifer sold will be used to assist with sale and Michigan Dairy Expo costs.

References
Members of the Michigan State University Collegiate and Ag Tech Dairy Judging Teams and over 25 Michigan 4-H and FFA members spent many summer and fall weekends visiting farms and judging cows in preparation for the fall judging season. The teams visited dairy farms in Michigan, Ohio, Indiana, Wisconsin, and Ontario, Canada. Practices were held at the Genesee and Shiawasee County Fairs and the community fair in Hudsonville, MI. A final summer workout was held at the Michigan State Fair. All of the practice and preparation paid off as the state of Michigan was successfully represented in several contests.

Two collegiate teams represented Michigan State University at a contest hosted by Accelerated Genetics in Viroqua, WI in early September. The MSU Collegiate team members for 2002 were David Bennett (Mayville), Cari Endert (Gladwin), Gabe Papoi (Charlotte), and Holli Whittenbach (Ionia). This team placed 9th in reasons and 17th overall. The second team members were Lindsay Kirk (St. Johns), Ashley Liddy (Gladwin), and Beth Munsell (Fowlerville). This team placed 3rd in Milking Shorthorns and 9th overall. Ashley placed 2nd in Milking Shorthorns.

The second contest of the year was the Pennsylvania All-American Dairy Show in Harrisburg, PA. The MSU Collegiate team placed 3rd in Jerseys and 10th overall. David was 1st in Jerseys. Michigan 4-H was represented by Diana Feenstra (Jenison). Jessica Geurink (Allendale), Carlyle Westendorp (Nashville), and Amanda Zwagerman (Zeeland). This team placed 5th in Brown Swiss, 2nd in Jerseys, 5th in reasons, and 4th overall. Individually, Diana was 2nd in Ayrshires, Amanda was 3rd in Jerseys, and Jessica was 4th in Ayrshires, linear evaluation, Guernseys, oral reasons, and placed 4th overall in the contest. A second 4-H team, whose members are also Michigan FFA, competed in the FFA division of the contest to gain experience for future contests. Team members included Baylee Brown (Cedar Springs), Greta Koehel (Three Oaks), Katie Meyer (Byron Center), and Mary Tenbrink (Coopersville). This team had an outstanding day and placed 1st overall. The team was 2nd in Ayrshires and Holsteins, 3rd in Brown Swiss, Jerseys, and linear evaluation, 4th in Guernseys, and 1st in oral reasons. Individually, Baylee was 3rd in oral reasons and 5th in Brown Swiss. Greta was 1st in Brown Swiss, oral reasons, and linear evaluation, 3rd in Holsteins, and 5th overall. Mary was 1st in Ayrshires and Jerseys, 2nd in Guernseys, 2nd in oral reasons, and high individual overall.

In late September, the Collegiate, Ag Tech, and 4-H teams traveled to Madison, WI for the national contest at World Dairy Expo. The Collegiate team placed 8th in linear evaluation and 17th overall. David was 7th in Guernseys. Holli was 8th in Jerseys, 11th in Ayrshires and 6th in the linear evaluation competition. Ag Tech team members included Hilary Heft (Ravenna), Jamie Perry (Sault St. Marie), Kyle Protzman (Caseville), Pam Radloff (Sandusky), and Steve Sweet (Edmore). The Ag Tech team placed 4th in Jerseys, 7th in Red and Whites, 6th in reasons, and 12th overall. Individually, Steve was 4th in Milking Shorthorns, Kyle was 7th in Jerseys, and Pam was 2nd in Red and Whites and 9th in oral reasons. Michigan 4-H was represented by Gayle Brasher (Pittsford), Honor Howe (Fremont), Bobbi Meyer (Byron Center), and Rena Smith (Ionia). The Michigan 4-H team placed 14th overall. The 4-H team was 2nd in Guernseys, 5th in Jerseys, and 7th in reasons. Bobbi was 8th in Guernseys.

The Collegiate, Ag Tech and 4-H teams also participated in the practical contest at World Dairy Expo. Nineteen university teams participated in this contest. This contest consists of three sections. The first section is evaluating and selecting commercially bred heifers based on price, health status, and production records. Team members evaluate body condition, feet and legs, udder promise, and estimate heifer weights and heights. Appropriateness of service sires is also evaluated. The second part of the practical contest involves evaluating a group of registered heifers (including pedigrees and genetic values) and determining economic values of the heifers. Finally, the team members perform linear evaluation on six cows. The practical contest offers students an opportunity to utilize practical knowledge and experience. The Collegiate team was 8th overall in this practical competition, and placed 7th in the commercial bred heifer evaluation and 9th in linear evaluation. The 4-H team was 6th in registered heifers.

The final contest of the year was held at the North American International Livestock Exposition in Louisville, KY. The Collegiate team was 8th in Jerseys, 10th in Brown Swiss, and 13th overall. The Ag Tech team placed 4th in Ayrshires and Guernseys, 3rd in Holsteins, 5th in Jerseys and oral reasons, and 5th overall. The Michigan 4-H team members for this contest were Allen and Arthur Gust (Manitou Beach), Matt Sneller (Sebewaing), and Carlyle Westendorp (Nashville). The 4-H team was 6th in Ayrshires, 2nd in Holsteins, and 13th overall. Carlyle was 3rd in Holsteins.

The Michigan 4-H teams are selected from the top 25 individuals at the state judging contest held during Michigan Dairy Expo in July. These individuals are invited to participate in several workouts during August, and the teams for each contest are selected at the end of August. All 4-H youth are invited and encouraged to participate in the contest at Michigan Dairy Expo and try-out for one of the state teams. The Collegiate and Ag Tech team members are selected from students at Michigan State University who have completed a judging course and have been part of the judging program during their education at MSU.
Upcoming Dairy 4-H Youth Events

Laurie Davis
Dept. of Animal Science

The State Dairy 4-H Committee is busy developing new ideas and activities for 2003.

For more information on the events listed below or any other Dairy 4-H activities, contact Joe Domecq, State 4-H Dairy Youth Specialist at 517-353-7855 or domecqjo@msu.edu, or Laurie Davis, Assistant Dairy Youth Specialist at 517-355-8319 or davisl5@msu.edu. Also, you can access the quarterly 4-H newsletters at the following website: http://www.canr.msu.edu/anscikids.

The 2003 Michigan 4-H Dairy Conference will be held at Kettunen Center, in Tustin, from April 4 - 6. This conference is designed for 12 to 18-year-old youth enrolled in the 4-H Dairy Program. Dairy 4-H youth from across the state will learn valuable information run throughout the conference. Registration fees are $40 for adults and $20 for students. The fee covers all handouts, Friday lunch and breaks. Registrations are due February 15. Call 517-351-9494 or 616-756-9606 or e-mail jkoebel@triton.net with questions or for registration information.

March 4, 11, 18, and 25 and April 1, 12. A Watershed Short Course will be held from 6:30 p.m. to 9 p.m. at the Allegan Tech-Ed Center, Allegan. The cost is $50. For more information, contact Larry Johnson at 269-673-0370.

April 11-12. 2nd Annual North American Intercollegiate Dairy Challenge will take place at the Clarion Hotel and Conference Center, Lansing. The MSU team earned reserve champion honors at the 1st annual national contest at MSU in 2002. Representatives from the dairy industry and MSU worked together to host last year’s contest on two Michigan farms for universities around the nation. Contact Miriam Weber Nielsen for more details at msw@msu.edu if interested in assisting with the contest.

Calendar of Events

February 21-22. MSU Dairy Challenge will be held in Anthony Hall at MSU. During this event, teams of college students visit and evaluate a dairy farm and present their evaluations to a panel of judges. Top students represent MSU in the national contest. Contact Miriam Weber Nielsen for more details at msw@msu.edu.

February 4. Manure Management Systems Plan Workshop in Conklin. Contact Ira Krupp at 616-846-8250 or Krupp@msue.msu.edu. The workshop will be offered again February 11 between 9 a.m. and 3 p.m. at the MSU Extension Office, Allegan. For more information contact Paul Wylie at 269-673-0370.

February 6. Allegan Telefarm Tax Estimate program, is scheduled from 8 a.m. to 5 p.m. at the MSU Extension Office, Allegan. For more information, contact Paul Wylie at 269-673-0370.

February 28 and March 1. The Great Lakes Dairy Conference will take place at the Sheraton Lansing Hotel, Lansing. An industry trade show will be held in the national contest on two Michigan farms for universities around the nation. Contact Miriam Weber Nielsen for more details at msw@msu.edu if interested in assisting with the contest.

related to the dairy industry. Activities planned for this year’s conference will focus on these topics: dairy foods evaluation; dairy cattle evaluation; mock quiz bowl contest on reproduction and genetics; mating strategies in dairy cattle; and dairy herd reproduction.

The 2003 4-H Exploration Days will be held at MSU from June 18-20. Three sessions will be offered that are dairy-related: fitting and showmanship clinic; using ultrasound to improve reproductive efficiency; and dairy foods evaluation. Exploration Days is created for youth, ages 12 to 19 and involves nearly 3000 participants from throughout Michigan.

Michigan Dairy Expo and 4-H Days activities will be held at the MSU Pavilion on July 21-25, 2003.

Meadows Dies

Clinton E. Meadows, MSU emeritus professor and extension specialist passed away January 4, 2003. Meadows was well known in Michigan and throughout the U.S. for his extension and research work in dairy management. He was especially recognized for his studies of how genetics affected milk production and the proper value of nutrition in dairy herd improvement. In extension circles he had a rare ability to make complex scientific findings easily understood by dairy producers. Meadows joined the MSU faculty in 1957 and retired in 1978. The C. E. Meadows Endowed Chair of dairy management was established in his honor in the Department of Animal Science. After retirement he continued involvement for many years in the dairy industry mainly through Michigan Animal Breeders’ Cooperative and Select Sires, Inc. A memorial service will be held at the Okemos Community Church (4734 Okemos Rd, Okemos, MI; 517-349-4220), at 10 a.m. on Saturday, February 22, 2003.
Dairy Herd Turnover
— How to Control It

The program begins at 9 a.m. and runs until 3:15 p.m. Topics include trends in culling rates and cow longevity; why the culling rate is important; how to monitor your herd’s culling; case studies as well as technical tips for udder health; metabolic/nutritional disorders; infectious disease; reproduction; lameness and injuries. We invite you to participate in the 2003 MSU Extension Dairy Educational Program.

DATES AND LOCATIONS

Feb. 4 (Tu) - Tekonsha
Union Church United Church of Christ, Corner of Church and Randall, 1 block West of Main St. (Old 27) in Tekonsha. From NB I-69, take Old 27 north into Tekonsha; continue on Main St. to Randall. From SB I-69, take M60 East to Old 27 (Main St.) south to Randall, 517-767-4199.

Feb. 5 (W) - St. Johns
Clinton County RESA, located in South-Point Mall, Business US-127, 989-224-6831.

Feb. 6 (Th) - Chelsea
Chelsea Fairgrounds Service Center, from I-94 take M52 Exit (Chelsea), Travel north about 1 mile to Jackson Rd. (Old Rt.12). Turn left (west) for one block and the fairgrounds will be on the left.

Feb. 11 (Tu) - Ubly

Feb. 12 (W) - Michigan State University
MSU-Pavilion - I-496/US-127, Jolly Rd. Exit (exit 11), east to Collins Rd. light, turn left (north) travel on Collins Road which changes to Forest St. to the east, then left on Farm Lane to Pavilion, 517-432-5566.

Feb. 19 (W) – Goshen, IN
Elkhart County Fairgrounds, 17746-E County Rd. 34, Goshen, IN.

EXTENSION CONTACTS

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<td>• Jeff Burbink ...................................... 574-533-0554</td>
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<td>• Bill Robb ........................................... 269-673-0370</td>
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PRE-REGISTRATION FORM

Please return this form with a check at least 14 days before the meeting you plan to attend:

Pam Jahnke
Department of Animal Science
Michigan State University
2265 L Anthony Hall
East Lansing, MI 48824-1225

1. Name ____________________________
2. Name ____________________________
Address ____________________________
City/State __________________________ Zip ______
Phone __________________________
County ____________________________

WHICH MEETING WILL YOU ATTEND?
Tekonsha
St. Johns
Chelsea
Ubly
MSU
Goshen

PRE-REGISTRATION IS REQUIRED!

Pre-registration is $40.00 per person which includes lunch and one program notebook. On-site registration is $50.00. Lunch for each additional farm or family member is $20. Lunch is not guaranteed for on-site registrants.

Number of people Fee Amount

__________ X $40.00 __________

Additional farm/family/business members:
__________ X $20.00 __________

Ck. Number Total Enclosed ______

Make checks to: MICHIGAN STATE UNIVERSITY
(Your canceled check is your receipt)

If you have need for special materials or services, please contact Pam Jahnke at 517-353-4570.
Michigan Dairy Review

Volume 8  Number 1
The Michigan Dairy Review is published in January, April, July and October by the Dairy Programs Group at Michigan State University. Its objective is to provide useful information to the dairy producers and dairy-allied industries of Michigan to enhance the potential success of their businesses. The Michigan Dairy Review can be located on the World Wide Web at http://www.mdr.msu.edu.

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