Managing Debt To Improve Cash Flow

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With currently depressed milk prices, many Michigan dairy operations are struggling to meet current cash flow commitments. This article, the first of a series of articles addressing cash flow problems, examines ways to manage debt. The other articles to follow will explore profitability of the Michigan dairy industry, other methods for improving cash flow (including income tax management), understanding and determining your production costs, and risk management strategies.

Why the emphasis on debt management in addressing cash flow problems? Preliminary 2002 financial figures for Michigan dairy farms in the Telfarm project emphasize the impact depressed milk prices have had on business cash flows. In 2001 the average dairy farm in the project had $74,359 available for servicing the principal and interest on intermediate debt. In 2002, less than $15,000 were available to service this debt.

Debt is utilized by most Michigan dairy operations. In 2002, the average Telfarm dairy farm had a debt-to-asset ratio of 31 percent, with a range from zero to 87 percent. About one-half of the debt was long-term debt (debt on real estate). Intermediate debt (debt on equipment, livestock and some buildings) accounted for 28 percent of the debt, with the remaining debt being short-term debt (operating loans and unpaid bills). Debt interest expense was 5 percent of cash expenditures.

How can debt management make a difference? First, because of the sluggish economy, the Federal Reserve System has implemented policies that have cut interest rates to their lowest level in nearly 50 years. These same policies have increased availability of capital. Thus, there are opportunities to restructure debt with a positive effect on both cash flow and business profit. Also, for some operations there are opportunities to make adjustments, aside from restructuring, with respect to debt and improving the cash flow. Possible adjustments are discussed later in this article.

When examining ways to improve cash flows through debt management, it is critical to determine whether the business is profitable. The difference between cash flow and profitability is a very important distinction and one that will be addressed in greater detail in a later article. It is possible to have good cash flow but not an economically profitable business and vice versa. It requires some effort to accurately determine if the business is economically profitable. If you do not know precisely the profitability level of your farm from an economic viewpoint, contact your local Extension agent and request that a business analysis be performed.

MSU Extension Dairy Agents

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Debt Management Goals

If you are considering debt management as a cash flow tool, what are your goals? For some, the desired goals are increasing farm profit and reducing annual payments for debt service. For others, these goals might be in conflict with the desire to have the business debt-free as rapidly as possible. Others might have difficulty accepting the transfer of debt from one type asset to another to improve cash flow. This might be the case when rolling operating and intermediate debt into long-term debt. It is essential that you clearly have in mind goals to be achieved and an understanding of the possible tradeoffs involved if modifying these goals.

Ignoring an expansion or downsizing of the business, if the goal is to increase business profits then it is necessary to secure financing that reduces overall interest costs. If the goal is to improve cash flows, then loan servicing outflows for both interest and principal payments must be less than what was paid previously. In some cases you may be able to achieve both increased profitability and improved cash flow. In other cases there will be tradeoffs involved. For example, when moving from a short-maturity loan with low interest rates and high principal payments to a longer-maturity loan with lower principal payments and a higher interest rate, profit would decline but cash flow might be improved.

In making these comparisons, remember that interest payments are tax deductible expenses while principal payments are not. If you are in a positive tax bracket (the sum of your federal tax bracket, the state tax rate of 4.1 percent and, if self employed, the self-employment Social Security rate of 14.1 percent), then the effective after tax cash flow of the interest cost can be calculated by multiplying the interest cost times one (1.0) minus the marginal tax bracket in decimal form. For example, if your interest cost is $30,000 and your marginal tax bracket is 28.2 percent, (10 percent federal marginal rate in decimal form). The effective after tax cash flow is $21,540 = $30,000 *(1 - 0.282)].

Also, not to be ignored are risks associated with debt. One of the risks to consider is the impact of converting a higher interest rate loan with a fixed interest rate to one with a lower but variable rate, (a rate that is based on a financial indicator such as the prime rate and is adjusted periodically). In this case, what may be promising in the short-run could be more costly in the long-run if interest rates rise to a level greater than the original loan.

Methods for Cash Flow Management

Get Rid of “Dead Assets”

People have a tendency to hold onto items that are rarely used or are simply held for convenience or nostalgic reasons.

1 This assumes the tax payer does not itemize Federal deductions. If itemizing deductions, then the state rate needs to be adjusted down. Itemized state rate = 4.1 * (1.0 - federal marginal rate in decimal form).

You should carefully examine your depreciation schedule. Do you really need all the assets that are listed on your schedule? Perhaps you have equipment you have not used or rarely used recently. Do you own real estate assets not earning income such as a wood lot? If you perform a thorough review of your assets, you will likely find several assets that might be classified as “dead assets” – those that are tying up business capital, incurring costs (e.g., taxes) and earning little or no income. By selling these “dead assets” you can use the funds to reduce debt on remaining productive assets.

Also, are you carrying excess input inventory? Do you have feed from a prior production year still in storage? This is often done to address risk concerns (e.g., desiring to avoid purchasing forages at high prices in a bad crop year). The interest cost on tens of thousands of dollars of excess feed in inventory over several years can easily exceed the higher cost of buying feed in a short crop year. Furthermore, there may be better ways for addressing these risks – a topic to be addressed in a later article. Are there other excess inventory items (e.g., fertilizers, protein feeds, etc.) that you could better manage to address current cash flow?

The same logic can be used for products produced by the farm (e.g., wheat). Do you really believe you can sell your crop in the future at a price high enough to more than offset the interest and storage costs related to holding that crop after harvest? The income from the sale of these products can be used to reduce debt.

Evaluate Alternatives In Acquiring Business Assets

Farming has become a capital-intensive industry. Costly assets are required for production but it is not always necessary that the business own these assets. Harvesting equipment is an example of these assets. If you do not own the assets, then you avoid interest and principal costs on the loans related to these assets and other ownership costs such as insurance and depreciation.

What are the options for having access to these needed assets but not having to assume the full cost of ownership? Have you considered joint ownership with another business? This spreads the ownership costs across two or more businesses. Other options to consider are custom hiring or short-term rental. Even though these options have some downside concerns (e.g., timing of harvest and care in harvesting), the net savings for the business can be substantial.

A similar argument can be made for land ownership. Depending upon your location, land ownership may not be a good long-term investment and rental should be considered.

By liquidating those assets the business needs but does not necessarily need to own, the income from the sale can be used to reduce debt. However, be aware that you will incur other costs in acquiring the use of these assets such as custom hire expenses and land rental and will assume additional risks (e.g., poor timing of harvest and the potential of losing the...
contract on a rented land parcel).

When exploring if debt restructuring will help your business cash flow and profitability position, first examine your current debt situation. This is debt on operating costs, including accounts payable. In a time of tight cash flows, it is common to pay less than the amount billed monthly by an input supplier such as the feed dealer or fertilizer supplier. This action often means giving up a double opportunity. First, many suppliers offer a 1 to 2 percent discount for full payment of the bill within a few days of the invoice date. Secondly, the unpaid balance on these accounts is charged interest at a higher rate, often in the 12 to 18 percent range. If you do not have the cash to pay these bills when due, you can save interest costs by arranging for a short-term loan from a financial institution at a lower interest rate. In arranging for a short-term loan or line of credit, you may be required to use long-term assets (e.g., land) as collateral. In the short run, this is a better option than securing a long-term mortgage on the long-term assets because the interest rate on the short-term loan should be lower and you are not locked into making principal payments since it is usually possible to roll the short-term loan over when it comes due.

Similarly, examine your credit card debt. A credit card is convenient for making small purchases but it is also risky if the balance is not paid off each month. Unless controlled, before you realize it, the balance on the credit card can quickly become large. Thus, paying off a credit card bill on a timely basis not only reduces the interest cost, which is often in the 12 to 18 percent range, but can also help you maintain control of expenses.

Once you have exhausted your options with current or short term loans, explore ways to improve your position on intermediate loans. These are loans on equipment, livestock and some buildings and facilities. You might have intermediate loans that were acquired when interest rates were higher. You should consider consolidating these high interest loans into a new loan at a lower interest rate. Also, examine the speed of the repayment schedule of the intermediate loans. These loans are often set up with a repayment schedule shorter than the expected useful life of the asset in the business. This is particularly true of buildings and other facilities. Consider refinancing these assets on a longer repayment schedule. This could help your cash flow by lowering both: 1) interest costs if it was earlier financed at a higher rate and 2) annual principal payments. In making these adjustments, be aware of some possible pitfalls. Avoid extending the payment period beyond the asset’s useful life. Otherwise, you will be making payments on an asset no longer earning income. Secondly, when considering the extension of the repayment period, some of the loans may be converted from intermediate loans to long-term loans. Currently, this may result in a higher interest rate. Furthermore, as a guideline, it is best not to let the long-term debt exceed 65 percent of the value of long-term assets.

Finally, examine long-term debt. This is usually real estate debt. As with intermediate debt, there may be options to renegotiate a lower rate and extend the repayment schedule. Both would help cash flow. The repayment schedule, if lengthened, means that it will take longer for the business to become debt free, which may conflict with some of your other business goals. However, this adjustment may allow your business to get beyond a short-term cash flow crisis.

There are other factors to consider when restructuring your loans. To help keep interest costs low, do some comparative shopping for credit. If a financial institution is offering lower rates than you are currently paying then use that information to negotiate a better rate from your current source of credit. If no concessions can be negotiated, then determine whether it is desirable to continue your relationship with your current credit supplier.

Also, for needed purchases, take advantage of those options offered by the seller as part of an incentive program. For example, it is becoming more common for a seller to offer a very low interest rate on a loan or the opportunity to not make payments on the loan for a certain period of time. These incentive programs can be a good short-term, low-cost source of credit.

In restructuring debt there are usually fees associated with the process (e.g., appraisal costs, processing fees, early repayment penalties, etc.). If these fees are large enough, restructuring the debt may not improve cash flow. Ask yourself, how long it will take for the interest saved in the refinancing to repay the fees related to the restructuring and is it worth the effort? To further help cash flows, determine if these fees can be included in the new loan.

Summary

Given the current capital markets with low interest rates and availability of funds, it might be an appropriate time to use debt management techniques to improve business profitability and cash flow.

Is debt management right for your business? If you would like to explore this issue in greater depth, contact your local Extension agent or District Farm Management agent.
Here Is a Debt Management Example

The example farm, which reflects an actual dairy operation, has a milking herd of 146 cows. Total assets are valued at $446,000. The debt on the farm is 54 percent of the assets with 10 percent of the debt being long-term debt, 61 percent of the debt intermediate debt and the remaining short-term debt. The farm in 2002 was beginning to experience some cash flow problems but is profitable. The farm is in good standing with its creditors. The primary business creditor has agreed to work with the management team to restructure debt.

The first area of adjustment was to reduce inventories of feeds and to sell wheat in storage. The combined sales value of $32,258 was used to reduce debt, resulting in an annual interest savings of $1,613. The grain combine could be sold, but the management team currently does not want to pursue this option.

The main adjustment used by the farm was debt restructuring. The outstanding balances on accounts with input suppliers was $47,862. By converting the majority of these balances to a lower interest (5%) short-term loan, the farm was able to save annually $5,026 in interest costs. The case farm is carrying a high percentage of debt on intermediate assets. Several of these loans were incurred when interest rates were higher. The loans on equipment had a current balance of $51,288 with an average repayment period of 3.2 years and an interest rate of 9.3 percent. These prior loans were consolidated to a new 5-year (still within the useful life of the equipment) intermediate loan at 5.4 percent interest rate. A 1 percent processing fee was charged for converting these loans. The conversion resulted in an annual savings of principal and interest of $7,155 ($1,970 interest and $5,185 principal). The farm also has debt ($98,177) on a recently built barn and parlor. The loan has 5.4 years remaining at 7.6 percent interest rate. The farm converted this to a 10 year long-term loan at 6.0 percent interest rate. The 1 percent loan processing fee was rolled into the new loan. This resulted in an annual savings on loan payments of $9,360 ($1,512 interest and $7,848 principal).

The case farm had relatively little long-term debt. The remaining debt of $23,364 has a 15 year maturity at 7.1 percent. This was converted to a loan of the same repayment period but at a lower interest rate of 6.5 percent. With the 1 percent loan processing fee, this results in a savings of principal and interest of only $73 annually. Not a large amount annually, but over 15 years it will amount to nearly $1,125. The interest cost will be less and the principal payment slightly higher. Since other loans were also being converted, it made sense to convert this one as well at this time.

Annually the case farm was able to reduce before tax interest costs by over $10,000 and principal payments by nearly $13,000. By getting rid of “dead assets,” the farm was able to also reduce the overall debt by over $30,000, even though it incurred over $1,700 in new debt because of processing fees. These debt management options should help return the business cash flow to a more acceptable level.

Economic Management

Milk Market Update and Voluntary Supply Control

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Summary statistics from 2002 confirm what you already know—it was a very bad year. According to the Michigan Agricultural Statistics Service, cash receipts from Michigan milk marketing were $712 million in 2002. This value was down 19.4 percent from that in 2001. The average value of milk sold was $12.10 per hundredweight, down a whopping $3.10/cwt from 2001. Milk production for the state was up 1.3 percent, and Michigan finished 2002 ranked 8th in total production. Milk per cow averaged 19,883 pounds (up 510 pounds per cow from 2001). The Michigan milk cow herd averaged 299,000 cows, down 4,000 cows from a year earlier.

Milk Production Up For 2002, But Now Dropping

For the US as a whole, milk production increased 3 percent in 2002 to 170 billion pounds. Average production per cow was 18,571 pounds, 412 pounds higher than in 2001. The annual average number of milk cows was 9.14 million head, 27,000 more than in 2001. US milk marketing cash receipts totaled $20.5 billion—17 percent below that of 2001. The average value of milk sold nationally was $12.19 per hundredweight, 19 percent below that of 2001. Despite the extremely low milk prices, dairy farmers were extremely resilient in maintaining—and even growing—production. This supply growth, coupled with stagnant demand, have conspired to keep Class III (milk for cheese) prices below support ($9.80/cwt) for 10 of the previous 11 months. Certainly, the MILC deficiency payments have enabled some producers to maintain cash-flow. However, for many producers, these payments have (or will shortly) run out for this fiscal year.

The May 2003 milk production and milk cow report, however, finally showed the decline in milk production growth rate that has been expected for several months. For the 20 major dairy producing states, May 2003 milk production
declined 0.4 percent from May 2002. Most of this decline was attributable to a five-tenths percent decrease in milk production per cow. In addition, dairy cow numbers in the 20 major dairy producing states were down 12,000 from March to April and another 13,000 from April to May. Futures prices for September and October bounced to the $13.00/cwt range the third week in June before falling back slightly.

By now you have probably heard about the Cooperatives Working Together (CWT) program. In fact, between writing this article and press time, the decision will be made on whether to move forward with the program. The CWT program is the brainchild of National Milk Producers Federation (NMPF), an organization of dairy cooperatives whose members produce about 70 percent of the national milk supply. Program directors agreed that at least one-third of the remaining milk, for a total of 80 percent of US production, would likely need to commit to participating to make the program a “go.” CWT would impose an 17.9 cent per hundredweight assessment to fund a three-pronged approach aimed at reducing milk supply by 2.7 percent (4.6 billion pounds) over a 12-month period thereby increasing milk price. The three program aspects include export subsidies, whole-herd buyouts, and a “dairy diversion” program, which would pay participants to decrease milk production by 10 percent over a 12-month period.

NMPF is projecting a net milk price increase of 82 cents per hundredweight for all participating farmers. This net is the result of a gross milk price increase of $1.30/cwt resulting from the reduction in supply over 12 months less the 18-cent assessment as well as the foregone Milk Income Loss Contract (MILC) deficiency payments. This net price increase estimate does not, however, adjust for any increased premiums that might result from tighter supply.

Participation goals are divided by region across the country (Figure 1). The intention is to remove more milk production from the growth regions and less milk production from regions that have had relatively stagnant production.

Program participation will be determined by bidding on the basis of hundredweights of production foregone. What kind of a bid might it take to get into the program? It seems likely that most of the buyout participants will be farmers that were considering leaving anyway. If this is true, bid value—in excess of cull cow price—is likely to be extremely competitive. NMPF has the goal of removing the most milk for the smallest amount of money. This would have the most impact, which likely means that the program will focus on low bids to reduce milk supply.

**Economic Implications Associated With Culling: Part 2**

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Last issue I addressed the cost of replacements and the capital requirements that culling imposes on your farm business. As we seek to move towards the goal of making better culling decisions in this issue let us also consider: 1) “optimal” culling rate, and, 2) the proper approach to individual cow culling decisions.

**Optimal Culling Rate**

Does an “optimal” culling rate exist? Some research suggests that optimal culling rate to maximize profit is in the range of 20-30% (1). However, these studies are based on some assumptions that may not apply to many dairy farms (constant herd size, no seasonal effects on reproduction or milk production, no culled cows sold for dairy purposes).

In reality, the question: “Is there an optimal culling rate?” is probably not answerable. Furthermore, when we talk about specific herds—for example, YOUR herd…it becomes even more difficult. Many factors are involved. These factors are difficult to quantify, and they often have a great deal of variation over time that complicates the formulation of a recommended “culling rate”. However, one thing can be said with certainty: All herds have the potential to improve profit by lowering involuntary culling rate. The only way to lower involuntary culling rate is through increased “management control” of factors such as reproduction, mastitis and other diseases, and nutritional disorders.

One study (2) focusing on culling showed that the annualized returns per cow steadily increased as the percentage of involuntary culling decreased and voluntary culling increased (Table 1). In other words, the better the...
“management control” of the herd, the higher the profit.

Let’s use these data on our typical 184-cow Michigan dairy herd. If involuntary culling could be reduced from 20% to 14% there is the potential to realize $45 more per cow in annualized returns. On a herd basis this would amount to over $8,000. The more problems management fails to control in the herd (e.g., reproductive failure, mastitis, displaced abomasums, etc.), the less control you have over culling. These problems do not allow us to pick and chose cows to remain in the herd simply on the basis of milk production. Therefore, as you are able to control such problems, you can put more culling pressure on low producers and, in the process, increase returns.

Generally, factors that tend to increase net income per cow tend to increase optimal culling rates (Table 2). Higher milk production and higher milk price, assuming other factors remain constant, increase net revenue per cow and allow animals competing to enter the herd to repay their purchase or rearing costs faster. Conversely, important factors tending to decrease net income per cow tend to lower optimal culling rates. Higher replacement costs and higher feed costs result in decreased net revenue per cow and make it more difficult for animals competing to enter the herd to repay their purchase or rearing costs. Also, from a cash flow standpoint, as revenue per cow declines (e.g., milk price decreases), most producers lower culling rates in an attempt to maintain cash flow.

Individual Cow Culling Decisions

Let’s now move on to the practical problem you as a dairy producer face each day…individual cow culling decisions. What kind of “culling decision rules” are available to help you make these important decisions. On the production side there are several possibilities. You could use: 1) DHIA standardized records (i.e., 305 day, 2x, mature equivalent milk records), 2) DHIA lactation ratings (i.e., “A” through “E”), 3) lifetime milk production, 4) production per day of life, or 5) estimated relative producing ability (ERPA).

On the economic side you might use projected mature equivalent dollar value from DHIA records or some measure of profit per day of life.

I would suggest that production-based decisions are not adequate to insure that you make the right culling decision. First, production is not 100% correlated with profit (I assume you are in business for that purpose!). It is often difficult to predict future production performance accurately. It is also difficult to cull accurately based on production alone because of the lack of timeliness of the information (e.g., monthly DHIA testing or semi-annual ERPA’s). Furthermore, I assume all of you have culled high producing cows…albeit reluctantly. You probably culled such cows due to reproductive or health problems. This illustrates the difficulty in quantifying the effects of these problems on production.

Finally, by purely focusing on milk production you are in essence asking the wrong question. The right question is not: How does this cow rank relative to her herdmates in terms of production? But rather: Is this cow making me less profit than a replacement could make occupying that cow’s spot in the herd?

Economic-based decisions have their own set of problems. First, it is difficult to properly and accurately quantify individual cow production costs. You may be able to do this on a herd basis, or even on a group basis, but on individual cows it is almost impossible. One of the prime reasons for this difficulty is the inability to accurately predict and quantify the economic effects of “cow problems” (e.g., health and reproduction). For example, given that cow 101 calved with twins, what is the likelihood that she will have “problems”; such as metabolic problems (e.g., ketosis, milk fever) that could lead to a displaced abomasum? How much will this cost in direct expenses (e.g., veterinary, medicine, labor)? How much will this cost indirectly (i.e., lost milk, delayed breeding)? All producers are painfully aware of the difficulty in making such predictions!

It is also difficult to predict the values of key economic factors that should affect your culling decision. For example, what will the milk price be when “cow 101” reaches peak production?

So how do you accurately know when to let a cow go? In a perfect world there would be a “bio-economic” model that would combine all the factors needed to accurately make the decision.
On the biological side you want to know such things as: 1) lactation number, 2) month of current calving, 3) stage of lactation, 4) pregnancy status, and 5) milk production. However, you need to know more about the biology, especially the likelihood of various “cow problems”. For example, given this cow’s history, what is her likelihood of having ketosis, milk fever, displaced abomasum, clinical mastitis, etc.? You would also like to be able to accurately predict the precise effect of such problems on future production. Furthermore, it is not “good enough” to be able to predict these factors as an “industry average”. To be truly useful you need to predict these factors on YOUR farm.

On the economic side, knowledge of a host of factors also is needed to make an accurate decision such as: 1) current and future milk prices, 2) current and future feed costs, 3) current and future labor costs, 4) current and future variable costs, and 5) current and future interest costs. But again, there is much more that you need to be able to accurately predict. Essentially you must try to accurately predict the potential future net income stream from this cow versus her possible replacement. A daunting task indeed!

If a producer is maintaining a stable herd size, then the actual decision on whether to keep a cow or let her go is essentially this: Which will be higher? The future net revenue streams from: 1) the current cow and her future replacements; or, 2) an average replacement heifer calving in the month a replacement is needed, and her future replacements.

Very importantly, notice that you are NOT seeking to maximize the lifetime production of individual cows. Nor, are you seeking to maximize the lifetime profit from individual cows. BUT, you are seeking to maximize the profit from a specific “position” in your herd.

Using MSU Coach Tom Izzo As An Example

To illustrate this concept, let’s look at an example. Tom Izzo has just been fired from his job as head coach of the MSU basketball team. You have been selected as his replacement. What is your goal? Let’s assume it is to win as many games as possible and take the NCAA title. What philosophy might you adopt to achieve that goal? Maximize point production from each individual player?

No, I suggest that would be the wrong policy. As head coach, you should strive to maximize the “margin” of point production from each of the five positions on the team. If each “position” outscores the same “position” on the opposing team the “total margin” will be higher and your “team” will win! You can see that in large part the focus has shifted from individual players to specific “positions” on the team.

So far I have been doing well at telling you what you already know… namely that these decisions are not easy. So, how do you make these decisions when you do not, and probably cannot have all of the information needed? Plus, no “black box” is available to crunch these numbers and give the correct answer. I cannot overemphasize that making sound culling decisions on individual cows starts by asking the right question. Again, you are NOT seeking to maximize the lifetime production of individual cows. Nor, are you seeking to maximize the lifetime profit from individual cows. BUT, you are seeking to maximize the profit from a specific “position” in your herd.

Even though there is no sophisticated, “fool proof” computer model to generate an infallible answer, the key is to have as much information as possible concerning individual cows. You need production information, reproduction information, health information, genetic information, and financial information. The culling decision will be easier as you gain more information and that information is organized and summarized.

Many of you have production information through DHIA. When was the last time you reviewed your health and financial records to estimate the frequency and cost of: 1) breeding a cow, and 2) treating ketosis, milk fever, or displaced abomasums? How often do cows give birth to twins in your herd? How often do these cows have health problems? What is the estimated cost of each specific “problem” in your herd?

These questions are not easy to answer, nor are they easy to quantify with 100% accuracy. However, it is vital to estimate them. If you do nothing more than go through the exercise of estimating them, you will have much greater ability to make more accurate culling decisions.

Summary

1) Replacement costs represent a significant cost of doing business. Lowering replacement costs allows more intensive voluntary culling and potentially higher net income.

2) Optimal culling rate is nearly impossible to define. Optimal culling rate “depends”. Factors that increase net revenue per cow tend to increase optimal culling rate because it allows replacements to pay back their rearing/purchase costs faster. Factors that decrease net revenue per cow tend to decrease optimal culling rate because it does not permit replacements to pay back their rearing/purchase cost as fast.

3) Decreasing involuntary culling and increasing voluntary culling will increase net income. The primary reason is that higher involuntary culling tends to be indiscriminate and removes relatively high producing cows from the herd that would not be otherwise culled. Therefore, focus management time and energy on identifying and reducing factors most responsible for involuntary culling in your herd.

4) There is no “fool proof” formula for making individual cow culling decisions. Approach culling from the proper “perspective”; seek to maximize income from each herd “position” rather than from individual cows.

5) Information is key to making accurate individual cow culling decisions. Are you keeping the right records and are they in a usable format?

6) Use a “decision tree” approach to make individual cow
culling decisions for immediate replacement. Most producers intuitively follow a similar approach already; but, by collecting and analyzing more information on your herd you should be able to refine this approach and increase its accuracy.

7) When the individual cow culling decision is not immediate use a “break-even” decision model. This concept simply involves requiring a cow to cover her average cash costs. When her milk production level drops below the point where she no longer covers these costs it is time to cull her.

**References**


**Nutrition Management**

**How Low Can You Go? The Forage Limbo**

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**Introduction**

Forage availability is sometimes limited because of poor growing conditions or because of insufficient land base on individual farms. In addition, forage fiber can limit feed intake, particularly for high producing cows, and forage quality is highly variable. Therefore, there is continual interest in alternatives to forages in diets for dairy cows. Decreasing the forage content of diets requires careful selection of ingredients for use in the dietary space created. Because cereal grains must be limited in diets to avoid ruminal acidosis, byproduct feeds with high fiber content are the most commonly discussed alternatives to forages and can be used to replace some, but not all, forage in diets of lactating cows. These byproduct feeds are referred to as non-forage fiber sources (NFFS) to distinguish them from other byproduct feeds. However, cereal grains can also be used in place of forages to some extent if fermentability of starch is reduced. Forage alternatives should be considered based on their ability to substitute functionally for forage. This paper discusses how forages function in diets of dairy cows and factors to consider when selecting forage alternatives.

**Forage Function**

Forages are unique compared to other diet ingredients because they provide long fibrous particles that are retained in the rumen longer and tend to ferment more slowly than smaller feed particles. This provides a consistent source of fuels to microbes in the rumen as well as a basal supply of fuels to the liver and mammary gland over time, allowing greater milk yield. Some long fibrous particles are necessary for formation of the rumen mat, which entraps small particles, increasing their ruminal digestibility. An adequate mass of digesta in the rumen is required to stimulate chewing, which increases secretion of salivary buffers.

A high supply of fuel from fiber fermentation in the rumen is highly desirable and dependent upon the digestion characteristics of the fiber source. Forage fiber should have a high turnover rate from both digestion and passage to maximize fuel supply while minimizing the filling effect of the fiber over time. Increased passage of particulate matter is also expected to increase efficiency of microbial protein production by increasing passage of attached microbes before they die and are redigested in the rumen. However, forages vary considerably in their digestion characteristics, and it is often desirable to find alternatives for poor-quality forages.

Forages also dilute rapidly fermentable feeds such as cereal grains in diets, thus preventing excessive ruminal fermentation. However, this function is not unique to forages, and the ability of feeds to slow ruminal fermentation while providing high total tract digestibility determines their value as a forage alternative. The concentration of forage in diets can often be decreased while maintaining or enhancing feed intake, milk yield, and health. Thus, it is possible to provide cows low-fill, highly fermentable diets that also result in consistent fermentation over time.

**Filling Dietary Space Vacated By Forages**

**Non-forage fiber sources**

The primary advantage of NFFS is that they generally have higher energy concentrations and are much less filling than forages; feed intake is limited to a greater extent when the neutral detergent fiber (NDF) concentration of the diet increases from forage compared with NFFS. They are commonly used as forage alternatives and vary widely in cost, availability, and chemical composition across type and location, and over time. Compared with cereal grains, NFFS are less likely to result in ruminal acidosis because they generally ferment more slowly, are not fermented to lactic acid, and because their rate of fermentation slows as ruminal pH declines. Like forages, NFFS often result in decreased propionate and increased acetate production in the rumen when substituted for cereal grains. A slower rate of fermentation and decreased propionate production might allow increased meal size and greater feed intake when meal size and feed intake are limited by absorbed propionate. However, substitution of NFFS for
Forage usually decreases the ratio of acetate to propionate concentrations in the rumen and also decreases ruminal pH. Wisconsin researchers reported that NFFS were only about one half as effective as alfalfa at elevating milk fat concentration and were less effective at stimulating chewing activity when substituted for grain in low forage diets. Another Wisconsin experiment found that NFFS were only 27% as effective as alfalfa silage at increasing milk fat concentration. Therefore, when replacing forage with NFFS, the effects of NFFS, cereal grains, and other non-forage diet components on ruminal fermentation characteristics must be considered in selecting the type and amount of NFFS and the proportions of forage and grain that will be replaced.

The fiber concentrations (NDF and soluble fiber) of most NFFS are in the range observed for most forages (40 to 60% on a dry matter basis), but some NFFS have NDF concentrations exceeding 75% (oat hulls, cottonseed hulls, ground corn cobs). The primary difference in the fiber of NFFS compared with forages is that particle size of NFFS is smaller, so NFFS cannot provide long fibrous particles to form a rumen mat. While some NFFS such as cottonseed hulls and oat hulls are poor sources of energy and protein and function only to dilute rapidly fermentable grains, most NFFS are also good sources of fermentable fiber. Some have additional value because they provide fatty acids and(or) ruminally undegraded protein. Soyhulls and beet pulp are excellent sources of fermentable fiber but have low protein and fatty acid concentrations. Crude protein concentrations of distiller’s grains, brewer’s grains, corn gluten feed, and whole linted cottonseeds are higher than most forages, ranging from 24 to 30% of DM. Whole cottonseeds, and to a lesser extent distiller’s grains, provide additional energy as fatty acids. The extent to which each NFFS should be used as a forage alternative depends upon its availability and price relative to other energy and protein sources, as well as its ability to substitute functionally for forage.

Recent research with lactating cows suggests that NFFS not only reduce the amount of starch fermented in the rumen when substituted for grain but also reduce the ruminal digestibility of the remaining starch. Illinois researchers substituted soyhulls for dry ground corn at 0, 10, 20, 30, and 40% of dietary DM and reported that ruminal digestibility of non-structural carbohydrates decreased from nearly 30% to less than 5% without reducing ruminal or total tract digestibility of organic matter. We recently reported similar effects on ruminal starch digestibility when pelleted beet pulp was substituted for high moisture corn at 0, 6, 12, and 24% of dietary DM. The amount of starch truly digested in the rumen decreased dramatically from 8.4 to 1.5 lb/d, partly because of the expected reduction in starch intake from lower dietary starch concentration but also from an unexpected reduction in true ruminal starch digestibility from 47% to 17% as beet pulp replaced high moisture corn in diets. There was no effect of treatment on total tract starch digestibility despite this large reduction in ruminal starch digestion because of compensatory postruminal starch digestion. In addition, true digestibility of organic matter in the rumen was not affected by treatment because of increased NDF digestibility; increased ruminal NDF digestibility and compensatory intestinal starch digestibility resulted in increased apparent total tract digestibility of organic matter as beet pulp replaced corn in the diet. The dramatic reduction in ruminal starch digestibility occurred because rate of ruminal starch digestion decreased from 11.3 to 1.7%/h and rate of starch passage from the rumen increased from 15.9 to 23.5%/h. It is not known if other NFFS have the same effects on rate of digestion and passage from the rumen, but they might also either increase or decrease ruminal starch digestion. It might not be desirable to reduce ruminal starch digestibility to the extent observed with the highest substitution rates of beet pulp or soyhulls, but the linear responses obtained in these two experiments suggest that NFFS can be used at lower substitution rates to manipulate ruminal starch fermentability and site of starch digestion. Therefore, substitution of NFFS for both forage and grain might be necessary to limit diet fermentability as the forage content of the diet decreases.

A limitation of NFFS as a forage alternative is that particle length is not adequate for formation of the rumen mat. In addition, passage rate is generally greater for NFFS NDF than for forage NDF, and ruminal digestibility can decrease if poor mat development reduces NDF retention time in the rumen. If adequate long particles are provided by coarse forage in the diet, NFFS can contribute to mat formation because they tend to be buoyant and become entrapped. Another limitation of NFFS is that, compared with cereal grains, NFFS provide fewer metabolic precursors of glucose, which can be limiting for lactose synthesis and therefore for milk production, particularly for high producing cows.

Cereal Grains

Although one doesn’t normally think of cereal grains as forage alternatives, they can also be used in the dietary space vacated by forage. Cereal grains contribute less to digesta mass in the rumen than NFFS because their retention time and water holding capacity are lower. The extent to which a cereal grain can replace forage in the diet without reducing feed intake or causing ruminal acidosis depends on its digestion characteristics. Cereal grains with moderate ruminal fermentability and high whole-tract digestibility, such as dry ground corn, are desirable to include in diets in place of forage. They are less filling than forages and have higher energy concentrations. They have an advantage over NFFS because
more glucose precursors are provided from starch digestion compared with fiber digestion as previously mentioned. Highly fermentable starch sources such as finely ground high moisture corn, barley, wheat, and bakery waste should be avoided to prevent excessive fermentation. Starch sources with low total tract starch digestibility such as unprocessed sorghum or coarsely cracked corn should also be avoided because they reduce the energy density of the diet.

Ruminal fermentability of starch varies among cereal grains, and it might be possible to increase meal size and feed intake by reducing ruminal fermentability and propionate production. A recent experiment from our laboratory showed that meal size increased from 4.2 to 5.1 lb., and feed intake increased from 45.8 to 49.5 lb/d, as dry ground corn replaced high moisture corn in high starch diets fed to lactating dairy cows. True ruminal starch digestibility decreased from 71% for high moisture corn to 47% for dry ground corn with no effect of treatment on total tract starch digestibility (95%). Although actual milk yield was similar for the two treatments, fat-corrected milk yield tended to be 6.6 lb/d higher for dry ground corn compared with high moisture corn treatment because of higher milk fat concentration. When forage is replaced with cereal grains, those grains with slower ruminal fermentation are likely to improve feed intake and milk production, depending on their digestion characteristics and other dietary characteristics as discussed below.

Considerations for Feeding Low-Forage Diets

The forage concentration of diets can be reduced by forage alternatives in many situations; in some, forage alternatives can replace a large fraction of the forage, allowing very low forage diets to be fed. Ohio researchers suggested that when diets for mid-lactation cows contain whole cottonseeds, they can contain as low as 9-11% forage NDF as long as non-structural carbohydrates (starch and sugars) are no more than 30% of diet DM. Diets without whole cottonseeds should contain no less than 14-16% forage NDF and no more than 30% non-structural carbohydrates. Nebraska researchers reported that a wet corn milling product (40% NDF, 23% crude protein) has the potential to replace all of the concentrate and protein) has the potential to replace all of the concentrate and protein. The forage content of diets can be minimized by considering the following recommendations.

Include forages with high fiber concentrations and long particles. Forages vary greatly in fiber concentration and particle size, and long fibrous particles distinguish forages from other feed ingredients. Therefore, the forage content of diets can be reduced if forage with higher fiber concentrations and longer particles are used. For instance, a diet formulated using a forage containing 50% NDF can contain 20% less forage to provide the same forage NDF concentration compared with a forage containing 40% NDF, because more fiber is provided per unit forage weight. However, it is also important to consider digestibility of forage NDF; increasing forage NDF by delaying harvest will decrease the rate and extent of NDF digestion, which will decrease the energy supply to microbes and to the animal. Across cuttings and maturities, NDF concentration is poorly related to digestion characteristics of NDF for alfalfa, so it is possible to purchase or select forage with both high NDF content and high NDF digestibility. Corn hybrids with high NDF and high NDF digestibility exist and can be selected when land is limited for forage production. Forages can be compared for NDF digestibility by in vitro rumen fermentation or by evaluating the lignin concentration as a percent of NDF; within a forage type, digestibility of NDF decreases as lignification of NDF (% lignin/ % NDF) increases.

Less forage is also needed in the diet if the forage is long or coarsely chopped. Fibrous particles of finely chopped alfalfa or corn silage are not as effective at forming a rumen mat as are longer particles from coarsely chopped forage. Addition of coarse fiber as chopped hay improves digestion of soyhulls; chopped hay also increases rumen mat consistency and rumination time and decreases passage rate of wet corn gluten feed. The length and concentration of long particles required in diets is not constant and depends on their digestion characteristics as well as characteristics of other diet ingredients.

Avoid rapidly fermented feeds. Rapidly fermented feeds containing sugars and starch should be limited. It is important to consider the fermentability of all diet ingredients when feeding low forage diets because most forage alternatives are more fermentable than forages and are also less effective at stimulating chewing. Limiting rapidly fermented feeds such as finely ground high moisture corn and molasses will reduce the risk of acidosis.

Manage to avoid slug feeding. Diets with less coarse fiber require less chewing during eating and can be consumed more quickly, resulting in larger meals before satiety occurs. Although this might be desirable to increase feed intake in some situations, it can also result in ruminal acidosis if fermentation acids cannot be absorbed quickly enough, and the buffering capacity of ruminal contents is greatly exceeded. Overcrowding and feeding for no weighback increases competition among animals and encourages slug-feeding and should be avoided when feeding minimum forage diets.

Include dietary buffers. Although efforts should be made to reduce fermentability by limiting highly fermentable feeds, and to reduce slug-feeding by providing adequate bunk space, inclusion of buffers makes sense as another way to reduce the risk of acidosis.

Limit NFFS with high fat content. Concentration and availability of polyunsaturated fatty acids might limit inclusion rates for some NFFS such as whole cottonseeds and distiller’s grain because of potential milk fat depression. Limitations depend on fatty acid concentration and composition of the NFFS and other dietary ingredients.
Summary

Forage alternatives can be used to reduce the filling effects of diets and to stretch available forages when their supply or quality is limited. Dietary space vacated by forage is filled primarily by high fiber byproduct feeds or by cereal grains. The extent to which they can substitute for forage depends primarily on their digestion characteristics; they should be slowly fermented with high total tract digestibility. Diet fermentability must be limited to prevent excess ruminal acid production. Adequate coarse fiber particles should be included in the diet for formation of the rumen mat to entrap and retain small potentially fermentable fiber particles, increasing their digestibility. When replacing forage with other feeds, it is important to consider digestion characteristics of not only the forage alternative but of all diet components.

Best Corn Silage: Timing of Harvest Key

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Production of high quality corn silage relies on several variables coming together simultaneously. The variable often overlooked is arguably the most important, the timing of harvest. Regardless of silo type or post harvest management, corn silage harvested either too late or too early can never be the excellent forage source required by high producing dairy cows. Starting the ensiling process with chopped forage with the right characteristics will produce high quality corn silage.

Consequently, management of harvest timing is the primary starting point to high quality corn silage. The measure that will point us to the appropriate harvest timing is the digestibility of the neutral detergent fiber (NDF) in the corn plant at harvest. Digestibility of NDF tells us something about how useful this forage will be as a candidate for ensiling and as a source of nutrients and energy for cows.

Understanding Digestibility

To better understand digestibility of the corn plant and its potential influence on corn silage production, consider what changes as the plant nears harvest time. Early on the plant is very digestible, high in fiber, high in sugars, and low in starch. Sugars are initially produced and stored in the plant tissues, but they migrate to the kernels during filling, eventually depositing as starch when the plant matures and dries. If the harvest occurs before the kernel has dented, the fermentation process would lead to energy storage in the silage as sugar. When consumed by the cow, this sugar is digested so rapidly the cow does not receive its full nutritional benefit. This also is a time when the corn plant is fully hydrated, and the ensiled forage can produce excessive amounts of seepage, draining away valuable nutrients and promoting poor fermentation in the silo.

As the corn plant continues to mature, there comes a point when the kernels are full and the sugar in them begins a transformation into starch. At the same time and associated with weather and plant maturity, the total moisture content in the plant begins to decrease. We visually recognize this period as the time when the kernel moves from being soft and fluid filled through the dough stages, then forming a dent followed by the milk line dropping to the base of the kernel. When the milk line disappears the black line forms. During this time the plant becomes more fibrous and ultimately more difficult to chop into uniform particles. At the end of this period, crude protein and digestibility also have decreased. Ensiling this material would be difficult. Silage that is dry will not pack densely, allowing air pockets to form, retarding the anaerobic fermentation process from completion. Molds develop under these conditions as well. The kernels also harden and become less digestible.

It’s All in the Timing

Harvesting at the wrong maturity adversely impacts silage quality. Early harvest will produce silage, which has a reduced nutritional value due to seepage and poor fermentation. Delaying harvest decreases the digestibility of the resulting silage. But somewhere within that range, from too early to too mature lies a time of optimum harvestibility. In this period, moisture is adequate for fast fermentation and the plant is not yet too fibrous to chop evenly. The sugar in the kernels has made the transformation to starch, yet the shell has not completely hardened. The question is how to determine this optimum period?

Many methods for timing of harvest have been suggested by researchers and used by producers. Observing “milk line” migration within the kernel or formation of the “black line” are tests that have received wide use. Unfortunately, these are tests that rely on the assumption that all corn hybrids are equal and every growing season is the same. Those assumptions are incorrect.

For these tests to work, all corn hybrids must dry at the same rate and have similar NDF digestibilities. Each hybrid must reach the optimum place on the milk line, for example, at the same state of whole plant moisture. Unfortunately these things do not always occur. Different hybrids will reach different whole plant moisture at different nutrients relative to the “milk line”. This can result in something less than the high quality corn silage that was originally planned.

Research from Michigan State University (1) indicates that the best method for timing of harvest is through the monitoring of whole plant moisture. Moisture content is the key to excellent fermentation. Monitoring moisture for timing of
harvest provides a consistent way to plan for harvest. This procedure can be used from year to year regardless of weather and hybrid type. The ideal moisture content for ensiling whole corn plant is between 65% to 70%. Outside this range promotes poor fermentation, loss of nutrients, low digestibility and the formation of undesirable byproducts, which will reduce feed quality. The type of storage facility also influences recommended moisture level for harvest. For horizontal (bunker) and bag silos, the recommended whole plant moisture content for harvest is 65 to 70%. For upright silos the recommended moisture range is 60 to 65%, and for oxygen-limiting silos 50 to 60% is recommended. The recommendations for moisture levels below 65% moisture dictate the need for a finer length of cut to promote better packing and oxygen exclusion during storage. The upright and oxygen limiting silages do not have means to mechanically pack the forages. The finer cut forage allows the silo to “self” pack more easily. Closely packed forages also minimize losses due to runoff and heating (2).

Measure Moisture Levels

To determine the appropriate time for harvesting a particular field, moisture levels from a representative group of corn plants must be measured. Recommendations are for a total of 10 entire corn plants (leaves, ears, tassel and stalk) to be harvested from several locations within the field. Chop whole plants into pieces at least one inch long. A forage harvester or a wood chipper can be used to do this. Next the chopped materials must be mixed thoroughly and the entire mixture evenly reduced to a size that will fit in the drying device. To do this, the chopped material is first placed on a tarp or plastic sheet on the ground. One at a time, each corner of the tarp is raised so that the mixture is rolled over itself at least halfway, and then the tarp is set back to its original position. Continue this procedure one corner at a time until each corner is lifted at least once, though more than once is preferable. Then evenly divide the mixture on the tarp in half and discard one of these halves. Continue to divide and discard until the remainder will easily fit into the drying device. This rolling and dividing procedure is designed to ensure that the final sample represents all parts of the field and all parts of corn plants in the field.

The percentage moisture is determined by weighing the undried sample, drying and weighing the dried sample. A Koster® type test unit or a microwave oven can be used to dry the sample. Determine the percentage moisture of the whole corn plants in the targeted field using the following two formulas:

\[
\text{Percentage moisture} = \frac{\text{weight of the moisture in the initial sample}}{\text{weight of the moisture in the initial sample} + \text{weight of the moisture in the initial sample}}
\]

Then use the formula:

\[
\text{Moisture of sample from the field} = \frac{\text{weight of the moisture in the initial sample} \times \text{percentage moisture}}{\text{weight of the moisture in the initial sample}}
\]

Moisture testing must start well in advance of when the proper moisture level is anticipated. If the percentage moisture of the sample is appropriate for the type of silo being filled, proceed with harvest. Otherwise, continue to monitor the moisture content.

Summary

Timing harvest through the use of moisture is a system through which producers can create a control or base point from which to begin the process of creating high quality corn silage. Once a control point is determined the quality of the final product can be better managed. Because the final quality corn silage is directly related to the moisture, selecting the proper time for harvest is absolutely critical.

References and Web Resources

3. The following Internet link describes a method for determining moisture using a microwave oven (http://ohioline.osu.edu/agf-fact/0004.html).

Learn How To Recognize Foreign Animal Diseases

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There are many infectious diseases of cattle that are not present in the United States. These are referred to as foreign animal diseases. The risk of intentional or unintentional introduction of a foreign animal disease into the US is greater today than ever before. Early detection is a key step in reducing losses to animal agriculture from a foreign animal disease. Over the next several issues of the Michigan Dairy Review, we shall provide a general description of foreign animal diseases affecting cattle that are considered high priority disease by the US Department of Agriculture. The purpose is to raise awareness about these diseases and hopefully provide the basis for early recognition of these diseases should they somehow show up on your farm.

Contagious CBPP

Contagious bovine pleuropneumonia (CBPP) is a highly infectious disease, primarily of cattle, affecting the lungs and occasionally the joints. There is no evidence to indicate that humans are susceptible to this disease. The disease is caused by a bacterium called Mycoplasma mycoides mycoides. This
agent is quickly inactivated when exposed to normal external environmental conditions. M. mycoides mycoides does not survive in animal products and does not survive outside the animal in nature for more than a few days. Many of the routinely used disinfectants will effectively inactivate the organism.

**Contagious bovine pleuropneumonia** is found in most of Africa. It is a problem in parts of Asia, especially India and China. Periodically, CBPP occurs in Europe with outbreaks occurring in Spain, Portugal, and Italy within the last decade. Contagious bovine pleuropneumonia is considered a foreign animal disease in the United States since its eradication in the 19th century.

**Contagious bovine pleuropneumonia** is spread by inhalation of droplets from an infected, coughing animal, thus requiring close contact for transmission to occur. Outbreaks usually begin as the result of movement of an infected animal into a susceptible herd. It is widely believed that recovered animals can harbor infectious organisms within their lungs and can become active shedders when stressed. There are a few reports of transmission by means such as vehicles or cloths, but this mode of transmission is not generally thought to be a problem.

The time from natural exposure to clinical signs of disease is generally quite long. Healthy animals placed in a CBPP-infected herd may begin showing signs of disease 20 to 123 days later. Under experimental conditions, the incubation period is 2-3 weeks.

**Danger Signs**

Usually the first signs of disease are depression, off feed and fever leading to coughing, chest pain and an increased respiratory rate. As pneumonia progresses and breathing becomes more difficult, animals are inclined to stand with their elbows set far apart in an attempt to decrease thoracic pain and improve their ability to breathe. They often make a pronounced grunting sound when they exhale.

Occasionally, pneumonia may be accompanied by a polyarthritis. This is most common in calves. Animals affected in this manner may be very reluctant to move and stand stiffly with a distinctly arched back. Getting up and down may cause obvious discomfort. Joints may be swollen and warm on palpation. If joint pain is severe, animals lie on their side with legs outstretched.

**The mortality (death) rate with CBPP ranges from 10 to 70% in various outbreaks.**

**Contagious bovine pleuropneumonia** often evolves into a chronic disease. These animals are typically weak and emaciated and will have recurrent low-grade fever. They are often difficult to recognize as animals with pneumonia.

At necropsy, there is severe pneumonia with abundant yellow fluid in the chest cavity. One or both lungs may be completely consolidated with a characteristic ‘marbled’ appearance. Affected areas are pink to dark red, swollen with a firm consistency. These lesions are usually unilateral. In chronic cases, necrotic lung tissue becomes encapsulated and the lungs become adhered to the chest wall.

The mortality (death) rate with CBPP ranges from 10 to 70% in various outbreaks. As with many infectious diseases, mortality may depend on other factors such as plane of nutrition, level of parasitism, and general body condition.

**Clinical Diagnosis**

Clinical diagnosis of CBPP is difficult. At necropsy, the gross lesions of CBPP are somewhat distinct; however, they may be confused with other pneumonic conditions, especially bovine pasteurellosis. Differentiation of CBPP from other causes of pneumonia requires isolation of the causative agent.

Although Mycoplasma mycoides mycoides is susceptible to many antibiotics, therapy may only serve to slow progression of the disease. In the case of chronically affected animals or subclinically affected carriers, the organisms may be sequestered in an area inaccessible to antibiotics.

Because CBPP is a chronic disease that can exist subclinically in carrier animals, it is important to prevent its introduction into healthy animals. In herds or areas where CBPP is suspected, serologic testing of susceptible animals is a recommended safeguard prior to movement. In endemic areas, successful control of the spread of CBPP requires removing susceptible animals from contact with CBPP-infected animals. In an outbreak situation, quarantine, testing, and slaughter would be the methods of choice.

Producers who recognize cattle with severe pneumonia or an unusual number of cattle showing signs of respiratory disease should consult with their veterinarian immediately.
Environmental Management

Environmental Stewardship: Controlling Silage Leachate

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Silage leachate, or seepage from silage piles, bags, bunkers, or silos often occurs on dairy farms. According to Michigan’s guidelines for a Comprehensive Nutrient Management Plan (CNMP), silage leachate is identified among manure and milkhouse wastewater on the list of farm outputs requiring proper management.

Why such concern over silage leachate? From an environmental standpoint, leachate presents a problem when it flows into surface waters. Silage leachate has an extremely high biochemical oxygen demand (BOD). This means that leachate has a very high potential for oxygen consumption and when discharged into surface water, can remove so much oxygen that fish and other aquatic creatures die. As little as 1 gallon of silage leachate can lower the oxygen content of 10,000 gallons of river water to a critical level for fish survival.

Nutrients Can Harm Groundwater
Silage leachate also contains nutrients that can harm groundwater; the most critical being nitrate-nitrogen. In addition, the acidic nature of silage leachate can burn or kill vegetation in the area where it drains. Farmers can opt to capture silage leachate by constructing lined ponds or collection basins. Such structures must meet prescribed setbacks from existing wells and surface water and are generally costly to construct. Systems can also be engineered that decrease the volume of material to be handled by collecting only the concentrated wastes while diverting the low-concentrated wastesto a designed grass filter area.

Once captured, leachate can be pumped or directed into an existing manure or milk house wastewater storage. However, this may contribute a significant amount of volume to the storage, particularly when rainwater runoff from a bunker silo is collected. Moreover, since leachate may produce dangerous hydrogen sulfide when mixed with liquid manure, it should only be added to well-ventilated, outdoor storages.

Minimize Silage Leachate Production
As an alternative to costly structures to catch silage leachate, farmers can and should make efforts to minimize silage leachate production. Fortunately, many of the recommended practices for harvesting and storing the highest quality silage go hand in hand with minimizing silage leachate. One of the most critical determinants of silage quality and leachate production is moisture of the forage at the time of harvest. Corn silage for bunker silos should be harvested between 65 percent and 70 percent moisture (30 to 35 percent dry matter). Moisture levels can be even lower for corn silage stored in upright silos or bags, though it should not fall below 60 percent moisture. A range of 60 to 70 percent moisture (30 to 40 percent dry matter) is optimal for alfalfa haylage harvest.

Silage harvested at higher than prescribed moisture levels can produce substantially more leachate. Leachate can have negative production-related consequences. It removes nutrients, particularly soluble nitrogen and carbohydrates, from the forage. Leachate can damage the silo structure because of its corrosive characteristics. In addition, silage harvested at higher than prescribed moisturess tends to have a higher prevalence of Clostridia bacteria. Such bacteria produce nitrogen compounds and butyric acid, which can reduce animal feed intake and silage protein levels.

Covering the silage is another important management practice for minimizing leachate. Not only do covers preserve forage quality by minimizing airflow into the pile, covers also reduce leachate production by preventing rainfall from penetrating the silage and solubilizing nutrients. A plastic covering secured with tires is one common approach to protect forage quality. Research at Kansas State University shows that covering a bunker silo with plastic can return $8 in reduced forage losses for every $1 spent. Additionally, from an animal performance standpoint, covering a bunker preserves feed value and improves palatability and feed intake.

Utilize Plastic Covers
Plastic covers should be applied so that rainwater and snowmelt is channeled off of the forage pile. The all too common practice of simply diverting water to the walls of the bunker silo should be avoided since water penetrating silage along the walls will still result in a leachate problem. Maintenance of plastic also needs consideration; any holes in the covering of a silo or bag should be repaired immediately.

Though the flow of silage leachate will be greatest during the first month following filing of a storage unit, leachate will occur in smaller amounts through the feed-out period, particularly when rainfall has access to the pile. The loading area should be kept clean of spilled silage. Silage that is not cleaned off of the loading area could wash offsite with rainwater and when wet, will continue to produce silage leachate. Divert rainwater away from silage storage whenever possible. Keeping open bunker silo faces vertical will also minimize contact with rainwater and reduce spoilage. An emergency backup plan should be developed for those years when high moisture silage is unavoidable. Temporary runoff containment measures could be used, such as using sawdust to absorb and stop silage leachate runoff. The sawdust could then be...
collected and applied to fields.

Summary
Although heightened awareness of silage leachate and runoff is necessary at harvest time, it poses a serious environmental risk year round. As responsible stewards of the environment, all producers need to be aware of the risk of silage leachate and take appropriate steps to reduce and manage it. If you would like further assistance in assessing your particular silage leachate management situation, seek assistance from one or more of the following resource persons: MSU Extension Dairy or Livestock Agents, your county USDA Natural Resource Conservationist, or a qualified engineering consultant.

Human Resource Management

Be a Servant Leader, Maximize Employee Performance

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The ability of your farm to remain productive and profitable is absolutely dependent on the effectiveness of the farm's workers to complete even the most fundamental tasks. Certainly, the farm owner and manager must make correct critical decisions, but without implementation of those decisions by the workers, the farm is still limited in its success. When a leader, such as a manager or supervisor, delegates a responsibility, no matter how significant or how basic, it is to the advantage of the farm business to inspire the worker to not only complete the task, but to excel at it. Achieving excellence is not a simple task. The “how to” of achieving it cannot be given justice in this brief article; however, some basic principles of encouraging farm workers to strive for excellence can be addressed.

A Good Leader?
An area of opportunity for reaching top worker performance is the worker’s natural desire to follow a good leader. The best supervisors in the workplace inspire their employees to excellence by tapping and nourishing this desire to please a competent leader.

Have you ever asked yourself, “Why would my workers want to please me as their employer and leader?” Beyond the “because I’m the boss” answer, every supervisor should ponder why any one of their workers would strive to do their best for them. The security of a regular paycheck helps, but financial compensation alone will not bring out the best in people. Factors that make most workers long to perform to their greatest potential involve the relationship with the supervisor. It only makes sense that the majority of people, if not all people, are much more apt to work harder for an employer and supervisor with whom they have a strong relationship. They will follow a leader who is genuinely concerned about them as individuals. People are less responsive to bosses who are only concerned with getting the work done. Leaders who are effective at getting top performance via genuine concern for their employees’ well-being are often referred to as servant leaders.

Servant Leaders
Servant leadership means recognizing and acting upon the physical and emotional needs of the workers. Some of these needs include affirmation, appreciation, personal and professional growth, compassion, understanding, trust, and consideration in matters that affect them. The most effective supervisors are sensitive to the needs of their workers and make a conscientious effort to respond to those needs in an appropriate manner. Certainly, one must be cautious of the legal and ethical boundaries of dealing with the personal matters of employees; however, the necessity to recognize those needs is still important. Failure to recognize and respond to the needs of your employees reduces their trust in your leadership and eventually will result in higher employee turnover.

The result of servant leadership is that workers know that:
• their leader deserves greater respect and appreciation;
• they can trust their supervisor to be fair and just;
• their efforts are appreciated and will be rewarded, and recognition is not necessarily always with financial incentives;
• they can share their concerns and ideas and they will be heard sincerely, considered, and responded to in an appropriate manner;
• they can admit their mistakes on the job, learn from them, and not fear for their physical or emotional well-being; and,
• they can envision being a satisfied, long-term employee of their current employer.

Making a decision to look first at what you can do for the worker, before considering what he or she can do for you, leads to a net result of enhanced worker performance. With few exceptions, employees of servant leaders look to go the extra mile for that leader. That means greater work efficiency, greater work quality, more innovation, more job satisfaction, and greater employee retention. In the end, the improvement of worker performance through servant leadership means more efficiency and more profits.

Additional Resources
For additional resources on servant leadership visit the website of the Robert K. Greenleaf Center for Servant-Leadership www.greanleaf.org or your local bookstore, where you can find many excellent books on the topic.
Dairy Foods

World Travel on a Full Belly!!

John A. Partridge
Dept. of Food Science & Human Nutrition


Answer: All are represented as namesakes in the wonderful world of cheese.

The above list is only a partial listing of cheeses from around the world that are named for a political location such as a village, city or county, or a physical feature such as a mountain, a river, or an island. Many of the cheese varieties associated with specific locations or features have become commonly used names for cheeses produced around the world. Cheddar is an example of a cheese that was named for a village in England, yet has grown in popularity to the point that today more Cheddar cheese is manufactured around the world than any other single variety. Cheddar is listed as a product of more countries than any other cheese. Depending on the use and origin, one may find other names such as rat, store, dairy, English, American and Yankee being used as adjectives to describe a particular Cheddar. Cheddar cheese also displays a remarkable variety of characteristics.

Cheddar cheese from England will tend toward a short, crumbly body with a sharp, high acid flavor, while Cheddar from North America will have a cohesive, waxy body with a less acid flavor. Although annatto color has no bearing on the flavor of cheese, the color of Cheddar may vary also, ranging from the natural white to fairly intense reddish-orange. The intensity of Cheddar flavor will vary with the amount of time the cheese spends in the aging room before going to market. Some mild Cheddars will be marketed as early as 2-3 months; however, most Cheddar is aged for 4-12 months to develop a range of flavor intensities from mild to sharp. Very high quality cheeses with good flavor balance may be held in the aging room for 2 or more years to develop extra sharp flavors and smooth, waxy bodies. From the meager beginnings in the village of Cheddar, England, this cheese has become a giant among both cheese producers and consumers throughout the world.

Product Identity Protection

Many of the cheeses associated with the above list have not developed the popularity of Cheddar cheese and have remained closely associated with their point of origin. Some even receive various levels of national and international protection for their names. In 1992 the European Union (EU) initiated a program of product identity protection for a wide variety of food including cheeses. The “Protected Designation of Origin” (PDO) and “Protected Geographical Indication” (PGI) symbols are enforced within the EU. The European Commission has published a list of PDO/PGI for foods from all commodity groups including cheese and may be found on the following website. (http://europa.eu.int/comm/agriculture/qual/en/1bbaa_en.htm)

Roquefort cheese is probably the best example of a PDO cheese. Deeds and other legal documents from as early as the 8th century and a letter of patent signed in the 15th century by Charles IV provide early evidence for the importance of this cheese. The first law in France for the protection of Roquefort cheese was published on August 31, 1696, giving the people of Roquefort the exclusive right to ripen their cheese in the caves at the foot of Combalou Mountain. These caves just happen to be naturally contaminated with the Penicillium roqueforti mold that provides the characteristic appearance and flavor and provides the ideal temperature and humidity conditions for the ripening process. The first legislation protecting the name, Roquefort, was published on July 26, 1925. The current “Protected Designation of Origin” specifies that Roquefort cheese must be made by traditional methods from raw, whole ewe’s milk from a region that comprises most of Aveyron and part of the adjacent départements of Lozère, Gard, Hérault, and Tarn.

Cheeses with strong traditional identities such as Roquefort, Parmigiano-Reggiano, Gorgonzola and Pecorino-Romano have widespread support for their protection within the EU and most of the rest of the world. However, there are other cheeses that have more controversial PDO/PGI designations. An example of this problem may be seen in the battle over “feta.” Feta cheese has been given a PDO by the European commission for manufacture from sheep milk or a combination of sheep and goat milk in Greece. Other EU countries such as France, Germany and Denmark have been contesting this PDO since its inception in 1992 because they produce relatively large amounts of “feta” cheese from sheep, goat, and cow milk. The most recent ruling by the European Commission has upheld the PDO; therefore, “feta” manufactured in Denmark must now go by the designation “white-pickled cheese” or find a new name that consumers will readily connect with this type of cheese. Feta will continue to be made outside the EU with the country of manufacture,
such as the United States, listed on the label.

**Remember Pinconning?**

Even Michigan has a little history with the naming of cheeses. Many customers still buy Pinconning cheese even though there are no manufacturers of cheese left in Pinconning. Traditionally aged at slightly elevated temperatures and for at least 120 days, Pinconning cheese has a more robust, sharp flavor than the more traditional Colby cheeses available on the market. There is no legal protection of the name, just a loyal following of consumers rooted in tradition. The next time you take a walk past your favorite cheese counter, remember to take along your world atlas to help plan a delicious trip around the world.

### Industry and University

**MSU Hosts 2nd Annual North American Dairy Challenge**

*Miriam Weber Nielsen*

Dept. of Animal Science

The Michigan State University team captured a gold rating or third place in the 2nd annual North American Intercollegiate Dairy Challenge held at MSU on April 11-12, 2003. *Holli Wittenbach*, an MSU student from Lyons, on an aggregate team with three students from other universities, achieved a silver or fourth place rating with her team. The dairy management contest tests students’ skills and knowledge of all aspects of a dairy business in an interactive, educational, and challenging contest. Students on the MSU team were *Jolene Griffin*, a junior in Agriculture and Natural Resources Communications from Hastings, MI; *Justin Peterson*, a senior in Animal Science from Tustin, MI; *Charles Rawlings*, a senior in Animal Science from Armada, MI; and *Tom Stakenas*, a senior in Agribusiness Management from Freesoil, MI. Team coaches were *Joe Domecq* and *Steve Mooney*.

**Teams Visit Farms**

Twenty-four four-person teams from 22 four-year college programs across the nation visited one of three dairy farms at the start of the contest. The three contest farms were Nobis Dairy Farms, Ken and Larry Nobis, St. Johns; T&H Dairy, Ken and Mike Halfman and Steve Thelen, Fowler; and the Schneider facility of Rich-Ro Dairy Farms, Chuck Feldpausch, St. Johns. Students were given selected farm records and then walked through the farm operation. After the farm visit, each team had the opportunity to interview the farm manager. In addition, students were provided with a laptop containing an electronic version of the herd’s production records. Each team then prepared a 20-minute presentation of their assessment and recommendations for a panel of judges and sponsor representatives, with an additional 10 minutes for questions from a panel of five judges.

Top honors were taken by Virginia Tech, Vermont Technical College 2+2 Program, and Washington State University, with each team receiving one $800 cash scholarship. California Polytechnic Institute at San Luis Obispo, Western Kentucky University, and the University of Vermont earned the runners-up awards and $400 cash scholarships.

The Dairy Challenge was created to enhance the education and preparation of students for careers in the dairy industry. MSU has partnered with the dairy industry since 2000 to stage an annual Dairy Challenge that combines the idea of a competition with concepts of farm evaluation used in dairy farm management classes at universities.

With leadership from a steering committee of dairy industry enthusiasts, the event was expanded to a national competition. This year, members of the steering committee recruited over $60,000 from the dairy industry to fund contest activities and to provide travel support to universities. The contest required assistance from many people, including the MSU Department of Animal Science, Dairy Extension, and representatives of the dairy industry. Jim Sipiorski of NorthStar Cooperative served as the contest superintendent.

The students representing MSU in the national contest were selected at the MSU Dairy Challenge held February 21-22. The contest farm was Trierweiler Dairy Farm near Portland, owned by Paul and Frank Trierweiler. The winning team received one $1,000 cash scholarship and consisted of *Garrett Landel*, Waldron; *Kristen Kramer*, Harbor Beach; *Justin Peterson*; and *Charles Rawlings*. The runner-up team, which received a $500 cash scholarship, consisted of *Hilary Heft*, Ravenna; *Jamie Perry*, Sault Ste. Marie; *Kyle Protzman*, Caseville; and *Steve Sweet*, Edmore. Other participants in the contest were *Josh Gamble*, New Carlisle, IN; *Kristy Herban*, Ludington; *Attalee Hardy*, North Adams; Holli Wittenbach, Lyons; Eric Benthem, McBain; Jolene Griffin; Amanda Peckins; and Tom Stakenas.

Cargill Animal Nutrition sponsored cash scholarships and meals for the event, polo shirts for all student participants, a gift of appreciation to Trierweiler Dairy Farm, and tickets for all contest participants to the MSU Dairy Club banquet where awards were announced. Judges for the contest were Dr. Dennis Arnold, Sterner Veterinary Clinic; Fred Martsof, Cargill Animal Nutrition; Kim Walters, NorthStar Cooperative; and Dr. Chris Wolf, MSU Department of Agricultural Economics.

The Department of Animal Science is grateful to the Dairy Challenge contest farms and judges for generous donation of their time and effort, and appreciates the continuing sponsorship by Cargill Animal Nutrition of the MSU Dairy Challenge. Special thanks goes to the MSU Extension Dairy Team, Doug Brook of NorthStar Cooperative, Steve Mooney and Laurie Davis for assisting in coordinating both contests.
Scholarships Awarded to Dairy Students

Miriam Weber Nielsen  
Dept. of Animal Science

Students with a dairy interest continue to benefit from outstanding scholarship support at Michigan State University. For the 2002-2003 academic year, over $60,000 was awarded to 26 incoming and current students planning to pursue careers related to the dairy industry. Scholarships are provided by the Michigan Dairy Memorial and Scholarship Foundation, Inc., and the Howard Cowles estate.

**Michigan Dairy Memorial Scholarships**

The Michigan Dairy Memorial and Scholarship Foundation has honored 133 dairy leaders in Michigan since its founding in 1955. Individuals honored during the last year include Bill Kruger and Harold Harrison. To date, over 300 MSU students have received scholarships from the Foundation. This year, scholarships were awarded to the individuals listed below on the basis of academic merit and professional goals.

**Freshman Scholarships ($1,000)**

**Joshua Gamble** grew up on a family dairy farm in New Carlisle, IN. He participated in 4-H for many years and attended the MMPA 4-H Milk Marketing Tour. Joshua is actively involved on his family’s farm and plans to operate a dairy farm after graduating from the Ag Tech Dairy Management program.

**Courtney Peissig** grew up on a family dairy farm in Dorchester, WI. Courtney has been active in 4-H, high school leadership and athletic activities, and served as the State FFA President and as Treasurer in Wisconsin. Courtney is studying Agriculture and Natural Resources (ANR) communication and plans a career in education and promotion in the dairy industry.

**Samuel Scarborough** from Stephenson worked on a dairy farm for several years prior to entering the Ag Tech program. He is currently the Michigan FFA State Treasurer and also works part time in a senator’s office. Samuel plans to work in the political arena on behalf of the dairy industry.

**Ag Tech Scholarships ($1,250)**

**Hilary Heft** from Ravenna is finishing her second year in the Ag Tech Dairy Management program. Hilary has worked on a dairy farm in all aspects of dairy management. Hilary plans to work as a herdsperson for a dairy farm and has special interests in managing reproduction and genetics.

**Pamela Radloff** from Sandusky continues to be actively involved on her family’s dairy farm, as she completes her second year of the Dairy Management program. Pamela is a member of the MSU Dairy Club. After graduation, she plans to take a larger role on her family’s dairy farm.

**Steve Sweet** grew up on a family dairy farm in Edmore. He currently works on a dairy farm in milking and field work activities and is finishing his second year in the Dairy Management program. Steve is a member of the MSU Dairy Club and plans to own a dairy farm someday.

**Jaime Zenker** from Albion is finishing his second year in Dairy Management. Jaime is a member of the MSU Dairy Club, the Fall 2002 Ag Tech Dairy Cattle Judging Team, and the Michigan Jersey Cattle Club. Jaime plans to work on a dairy farm after graduation.

**Dairy Memorial Scholarships ($2,500)**

**Julie Braid** from Durand is a junior in ANR Communications and plans a career in agricultural law. She grew up on a family dairy farm where she continues to be actively involved. Julie is a member of Agricultural Communicators of Tomorrow and is employed at the State 4-H Youth Development Office.

**Kristy Daniels** grew up on a family dairy farm near Sterling and is completing her degree in Animal Science. Kristy has participated in the national Dairy Challenge contest and works as a student assistant in dairy physiology and nutrition research. After graduation, she will pursue her Master’s degree in dairy science at Virginia Tech.

**Mary Daniels** from Whittemore is a sophomore in Animal Science and plans a career in veterinary medicine. Mary has been actively involved on her family’s dairy farm and as a volunteer at a local veterinary clinic. Mary is a member of the MSU Pre-Vet Club and the Honors College.

**Cari Endert** grew up on a dairy farm near Gladwin. She is completing her degree in Animal Science and plans to work in the dairy industry in consulting. Cari is a member of the MSU Dairy Club, the Fall 2002 Dairy Cattle Judging Team, and works as a student employee in the Department of Animal Science.

**Calby Garrison** is a sophomore in Agribusiness Management from Onsted. Calby is Treasurer for the MSU Dairy Club, a member of Alpha Gamma Rho fraternity, and a member of Student Senate. Calby continues to be actively involved on his family’s farm and plans a career in the dairy industry.

**Emily Green**, a senior in Agriscience Education with a minor in biology, grew up on a family farm in Elsie. Emily was a member of the MSU Dairy Cattle Judging team and the MSU national Dairy Challenge team. After graduation, she plans to work in agricultural development in a Spanish-speaking country.

**Kristina Herban** from Ludington is a junior in Animal Science planning a career in veterinary medicine. Kristina has worked as an animal health assistant for the Michigan Department of Agriculture and as a laboratory assistant in the Department of Animal Science. Also, Kristina has been very active in the MSU Dairy Club.

**Megghan Honke** from Byron is a junior in Agriculture and Natural Resources Communications. She has been active...
Katie Hyde from Morley is a sophomore in Veterinary Technology. On her family’s farm, Katie assists in feeding, milking and general farm chores. In addition, Katie is a member of the MSU Dairy Club and the Pre-Vet Club and works as a laboratory assistant in the Department of Animal Science. Katie is planning a career in veterinary medicine.

Jeffrey Lehnert, a senior in Animal Science, continues to work on his family’s dairy farm in Remus. Jeff completed a summer internship with Vigortone and also is employed at the MSU Dairy Teaching and Research Center. He is an active member of Alpha Gamma Rho. After graduation, Jeff plans to return to the family farm.

Brandon Lupp from Sebewaing is a senior in Agriculture and Natural Resources Communications. Brandon has been active as an Ambassador for the College of Agriculture and Natural Resources, as the 2001 FFA national officer candidate for Michigan, and in the National Agri-Marketing Association. He is planning a career in agricultural education and communications.

Carri Morlock from Reed City is a senior in Veterinary Technology. Carri grew up on a family dairy farm and has worked for a local veterinarian for several years. In addition, Carri is a member of the Block and Bridle Club. She plans to work as a veterinary technician after graduation.

Beth Munsell grew up on a family farm near Fowlerville. She is a junior in Animal Science and plans a career in dairy research. Beth works as a laboratory assistant in the MSU Animal Behavior Laboratory. In addition, Beth is very active in the MSU Dairy Club and the Michigan Junior Holstein Association.

Rebel Smith grew up on a dairy farm near Fremont. Rebel owns and manages a replacement heifer operation, in addition to working on a dairy farm. Rebel has been active in the Agriscience Education Club, FFA, and as a resident mentor at MSU. Rebel is a senior in Agriscience Education and plans to teach agriscience at the high school level.

Emily Sneller is a sophomore in Crop and Soil Science from Sebewaing. She works on her family’s dairy farm and is active in the MSU Dairy Club, the Agronomy Club, the Michigan Junior Holstein Association, and dairy judging. Emily is planning a career related to the application of biotechnology in agriculture.

Lora Sommers from Marshall is a senior with a double major in Agriscience Education and Agriscience Communications. Lora has worked on a dairy farm and is active in the Agricultural Communicators of Tomorrow. Lora plans to become a high school agriscience teacher.

Robert West, Jr. is a sophomore in Agriscience Education from Onsted. Robert works at the MSU Dairy Teaching and Research Center with responsibilities in milking, animal care, and maintenance. He is a member of Alpha Gamma Rho and the Agricultural Education Club. After graduation, Robert plans to teach agriscience at the high school level.

Russel Erickson Scholarship ($4,000)

Ashley Liddy grew up on a family dairy farm near Gladwin. A junior in Animal Science, Ashley continues to work on her family’s farm in addition to being active in the MSU Dairy Club, the Michigan Junior Holstein Association, and the Block and Bridle Club. After graduation, Ashley plans to work for a company in the dairy industry.

Glenn & Ann Lake Scholarship (full tuition and fees for fall and spring semester)

Melissa Siemen, a senior with a double major in Agriculture and Natural Resources Communications and Advertising, grew up on a family dairy farm near Harbor Beach. Melissa works as a student employee in the Department of Agriculture and Natural Resources Education and Communication Systems. In addition, she is active as a Student Ambassador for the College of Agriculture and Natural Resources and as a member of Student Senate, National Agri-Marketing Association, and Sigma Alpha. Melissa is planning a career in advertising in the dairy industry.

Jack & Betty Barnes International Michigan Dairy Memorial Endowed Scholarship ($1,000)

The Barnes scholarship is given annually to a student interested in a dairy industry career who is participating in an international experience to enhance his or her education. This year’s recipient was Kristina Herban, who is mentioned above. Kristina participated in a study abroad program on Production Agriculture, Horticulture and Turfgrass in the United Kingdom and Ireland in summer 2002.

Howard Cowles Dairy Scholarships

The Howard Cowles Dairy Scholarships are given annually to students in Animal Science who have attained junior status and demonstrated a strong interest in dairy. Academic achievement and participation in extracurricular dairy activities such as the MSU Dairy Club or MSU Dairy Judging are given strong consideration. The scholarships are provided by revenue from a gift from the estate of Howard E. Cowles, who was a long-time employee of Sealtest Dairy. This year’s recipients were Kristina Herban and Beth Munsell, who were mentioned above.

For additional information on making contributions to honor members of the dairy industry or to support student scholarships, please contact the College of Agriculture and Natural Resources Development Office at (517) 355-0284. To learn more about the Michigan Dairy Memorial and Scholarship Foundation, contact Dr. Miriam Weber Nielsen in the Department of Animal Science at (517) 432-5443 or by e-mail at msw@msu.edu.

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