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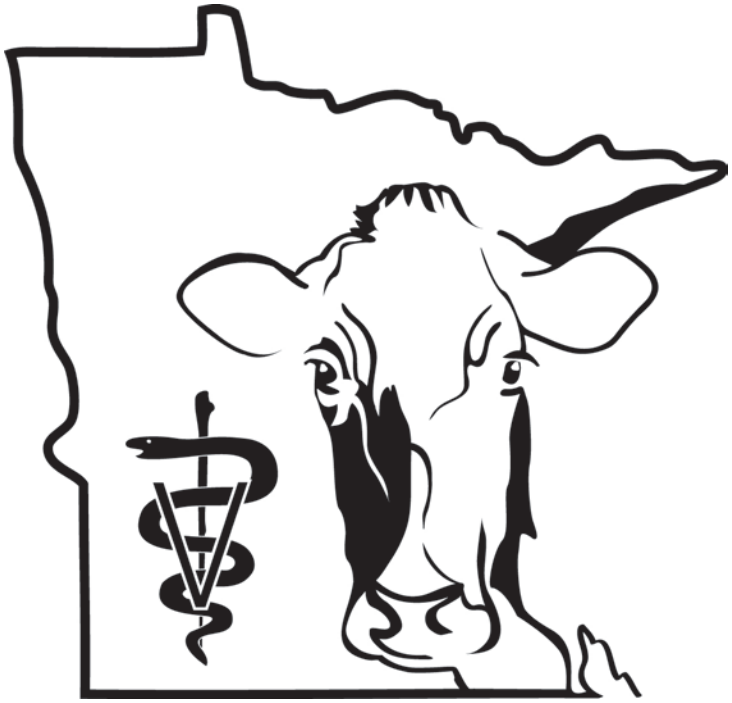

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Making Money on a Dairy Farm, or the Value of Marginal Thinking

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Every dairy practitioner is called upon to advise their clients about management. For some, it is the most significant part of their veterinary practice. Obviously, good advice depends on adequate knowledge and careful consideration of the effects of a particular decision. In most cases, the decision will need to be based on the particular dairy's circumstances: their facilities, labor, biological performance, and economic situation. General discussions such as this paper may develop their recommendations based on broad "industry standards" or similar benchmarks, but the proper course for a particular dairy at a particular time must be more specific.

The veterinary profession has come a long way in its ability to collect or access the information needed in our advisory capacity to dairies. More than that, veterinarians have become more adept in our efforts to analyze and frame specific recommendations. Computer systems have provided useful tools and analytic approaches. Veterinarians are more at ease and facile with records analysis, graphics, and spreadsheet and other modeling programs. As the quality of data and computer systems becomes better, the veterinary profession is asked to undertake more and more sophisticated analyses and to advise on aspects of management with a far greater span of effects. The questions move beyond issues of individual animal therapy to ones that affect all cows and the dairy's general economic performance.

In light of that change in the profession's role, it is useful to consider some aspects of the information we use and the framework in which we use that information. There are some very prevalent errors of thought driving decisions on dairy farms that a careful consideration can correct. This paper will attempt to frame some of the sources of those errors and to lay out an alternative and more useful approach to making some decisions on a dairy.

Averages:

Much of the data or information available to the practicing veterinarian is in the form of averages. Dairies are replete with averages: rolling herd average milk, average days open, average milk per cow per day, average feed cost per hundredweight of milk, average age at first calving, etc. Averages are valuable and useful "first cut" parameters of a dairy's performance. Dairy veterinarians and their clients use them daily as a shorthand summary of the dairy's biological (milk per cow per day) and economic (net farm income from operations per cow) performance. Averages can be a useful measure of a farm's status, but it is only one measure. When making specific management decisions, averages can be misleading sources of information.

of a farm's status, but it is only one measure. When making specific management decisions, averages can be misleading sources of information.

First, the averages themselves may not accurately reflect the farm's real status. Averages are vulnerable to several types of error. Averages may suffer from significant ***lag***. The measured effect of a change in management status may lag far behind the value reflected in a calculated average. For example, a failure of the breeding program in replacement heifers may not be reflected for more than a year in the average age at first calving. Many of the averages used on dairies contain a great deal of ***momentum*** built into the manner in which they are calculated. Rolling herd average milk production, for example, includes the production of cows over the past 12 months in its calculation. Extreme changes in current production are required to change the course of rolling herd average. Many of the averages used by dairies are also subject to ***bias***. Services per conception is biased toward a favorable view of the reproductive status of the dairy, since only those cows that conceive enter into the calculation, ignoring the undesirable outcomes in open, repeat breeding cows. Culling and the deliberate exclusion of "do not breed" cows from many reproductive calculations can play havoc with the accurate expression of a dairy's status.

Beyond these potential sources of error, averages also are deficient in characterizing a dairy because they, of necessity, express only the central point on a distribution. Averages do not describe or display the degree of spread, of ***variation***, in the population. The degree of variation is a key element in evaluating a dairy farm's performance, and identifying cows at the extremes makes it possible to affect their future. For example, average days open of 120 days may not be serious if all cows are open between 80 and 150 days. If the spread is from 45 to 250 days, the problem is likely more severe and costly. Even if a herd has a days open of 110 days, the individual cow left unbred for 180 days deserves identification and intervention.

Averages can be particularly dangerous when used in making *economic* decisions. Economic decisions based on averages can be seductively appealing; at first glance they can seem like "common sense". In fact, dairies often make decisions based on such "common sense" (or what has been called "diner logic"). Often, these common sense decisions are wrong, and very costly. The bulk of this paper will focus on this problem.

Before leaving the issue of averages, however, it seems prudent to step back and acknowledge that all averages are not useless. They can and should be used in evaluating a dairy, provided that the person doing so understands their shortcomings. In economic terms, the average performance of the dairy is critical. The bank will get paid from the average net income per cow. The dairy family will buy food and clothing from the average profits. Equity in the farm will be built on the average retained earnings. The point being made is not that averages can be ignored. but rather that one should think of averages as the goal to be attained, not the basis for managerial decision making. Management must act based on the specific case; averages "happen" as the sum of the experience of a series of specific cases. Keep in mind that on all dairies the average cow

is healthy, pregnant, milking an average amount of milk, and happily bored. Today's management cannot be based on her status. As a crude example, if on average cows do not get milk fever on a farm, it does not mean that the farm should not keep calcium on hand.

Averages and economics:

Consider the following decision scenarios that might face a dairy.

1. Current farm financial analysis shows that the average cost of production per hundredweight (cwt) of milk is $12.50. Regional supply and demand have driven the price of milk down to $12.00 per /cwt. A salesman drops by the farm and offers to sell a product to your client that will cost an additional $6.00 for each additional cwt of milk it will induce. Should your client pay one half of the extra milk check ($6.00 per cwt) for the product to get the extra milk?

2. The dairy feeds a TMR ration, balanced by production group. The dairyman is concerned about the waste of feeding TMR that is not consumed, and so works diligently to fine tune the amount fed so that the cows "just clean it up".

3. The farm is having troubles making ends meet. His financial consultant points to a high average feed cost per hundredweight of milk. The dairyman notes that feed costs are more than half of all expenses and decides to increase his profit by cutting feed costs.

4. Still focusing on saving feed costs, the dairyman decides to move cows whose production is down a bit from the high group to the low group. His nutritionist balances the low group for a cheaper ration.

Imagine, for a moment, that you are at the local diner on Saturday morning after a calving, sitting in the booth next to several dairymen. You overhear these scenarios come up in their conversation. What do you predict their "common sense" response to each scenario would be?

1. Politely ask the salesman to leave. If I am losing 50 cents on every cwt of milk I sell, why would I pay $6.00 per cwt **extra** for more milk?

2. Of course you want to trim feed in the bunk to avoid waste. When times are tough, why waste feed the cows might not eat?

3. It only makes sense that if your average feed costs per hundredweight are too high you have to find a way to cut the cost of the ration you feed.

4. Everyone moves cows to groups as they drop in milk production (don't they??). Why feed an expensive ration to a low producing cow? She'll just waste it, or get fat.

A strong argument can be made that each of these responses, for many if not most dairy farms, is wrong. The right decisions run counter to "common sense" and defy "diner logic". The explanation for this counterintuitive response rests on the distinction between decisions made based on the **average** versus those based on the **margin**.

Marginal Thinking:

When facing an economic choice, they dairyman (and the veterinarian as their consultant), should base their analysis on the marginal impact of the decision, not on the farm's average performance. An contrived example can help make this clear. Suppose, hypothetically, that a swine farm is facing hard economic times. The farrowing operation sells feeder pigs for $35.00 per pig. The farm's average total cost per pig is currently $40.00. Thus on average, the farm is currently losing $5.00 per pig for each pig it sells. Their veterinarian, on a routine walk-through of the farrowing house, notices a newborn piglet with an inguinal hernia. She inquires about the farm's policy regarding such pigs and is told that they routinely euthanise these pigs since they do poorly and are not worth the trouble. She offers to surgically correct the hernia for $10.00 and can assure the farmer that after surgery the pig will be healthy and indistinguishable from any other pig on the farm. Should the farmer pay an extra $10.00 for the surgery when he is losing $5.00 on every healthy pig that leaves the farm? Common sense would say no, but consider the following analysis:

Euthanise the pig:

$0 revenue
$0 expense
$0 profit

Surgically correct the pig:

$10 surgery
$10 feed to bring that specific pig to market size
$2 labor to move, sort, and vaccinate that specific pig
$1 vaccine and incidentals used on that specific pig

$23 total expenses that are added to the farm as a result of having the extra pig

$35 revenue when sold

$12 profit from that specific pig!

So doing surgery (and paying $10 to do so) on the pig yields an additional profit of $12.00 versus the $0 profit from euthanasia. Obviously, the better choice is to do the surgery and earn the profit. One might immediately protest that the analysis is flawed, since at the outset the scenario stated that the average cost per pig was $40.00, and the analysis of this pig shows the cost to be only $23, even with the added $10.00 for surgery. In fact there is no contradiction. The $40.00 of costs apply to the **average** pig,

while the $23.00 of costs apply to the **marginal** pig. Our extra, surgically reincarnated pig is a marginal pig, not an average pig. This extra pig does not have to pay the mortgage, the electric bill, insurance, manure handling, etc. If in doubt about this assertion, consider the farm's fiscal status if the pig is euthanised. The mortgage is not reduced, nor is the electric bill, nor the manure management fee, nor are a host of other expenses on the farm that, related to this specific marginal pig, are "fixed".

{The above example is a simple partial budget, the accounting technique used to calculate the marginal effects of a management decision. In this case the outcomes were assumed to be a certainty, i.e. euthanasia is 100% effective, as is the surgery, and once repaired, the pig is always sold. There are additional techniques that can be used to deal with uncertainty in a marginal analysis (such as decision tree analysis) that achieve an "expected value" of the profit outcome of a particular decision.} Ultimately, the best management decision will depend on the outcome of the marginal analysis, the manager's preference, and on what other investment opportunities are available.

The example of the marginal pig is instructive. It illustrates the power and profitability of the last increment of production. In nearly all cases, the most profitable unit of physical production is the last one, viewed from a marginal analysis perspective. In practical application, the profit from the marginal pig is $12.00, even though the average profit from every pig that preceded it was a loss of $5.00. What does the extra profit mean to the farm's financial status? Assuming the scenario held for an entire year, the marginal pig's addition to profit would be accounted for by reduced costs per pig, not increased revenue per pig. The average cost per pig would be reduced from $40.00 to $39.98 or some similarly small amount and the average profit per pig would increase from a loss of $5.00 to a loss of $4.98. In itself not a major result, but what if this could be done on one pig in every two litters? Hernia surgery may not have that potential, but what about attended farrowings?

Returning to the dairy industry, the question inevitably arises, which decisions on a dairy are marginal decisions and which are average? In many cases, farmers are used to thinking in marginal terms. Most understand intuitively that planting an extra 50 acres in corn does not need a new tractor, only the direct field inputs. In this case, their approach is marginal analysis and is right. In day to day dairy management, however, dairy producers make common and costly mistakes related to failing to think in marginal terms. One way to conceptualize the case of a marginal analysis is to start with the farm enclosed in a clear bubble. Marginal analysis asks: what is added into the bubble and what does it cost (marginal input), what happens to that input, and what comes out of the bubble and what is its value (marginal output). Marginal output minus marginal input (valued in dollars) is marginal profit. With that framework, which of the following is a marginal decision and which is an average decisions?

1. treating a cow that has milk fever? Clearly this is marginal. The average cow never gets milk fever. The marginal input (a bottle of calcium, some labor, veterinary charges if relevant) has a cost. A living cow (instead of a dead one) has a value. Treating milk fever is a very profitable enterprise. The decision to do so is a marginal decision.

2. adding bicarbonate to a ration? At first, this may appear to be an average decision, since it is fed to the average cow. In fact it is a marginal decision. Consider the farm in the bubble. Bicarbonate will be added into the bubble, fed to cows, and (hopefully) more milk and fewer culls will emerge from the bubble. Marginal means adding inputs that were not there before and measuring the financial effects.

3. adding one cow to the 1000 cow dairy? Again, a marginal decision. The dairy has to pay for the cow, her individual incidental costs like vaccine and extra paper towels (negligible) and must pay to feed her. In return, the dairy gets the benefit of the marginal milk she adds to the bulk tank, and ultimately her value when culled. This is a classic marginal analysis. This benefit does not go on ad infinitum. At some point, adding one more cow will produce no more profit or may even reduce profit due to overcrowding, bunk space competition, etc. Also, for those dairies that operate under a milk quota system, the marginal value of the extra milk (if above quota) may be small and not worth the cost of production.

4. adding one cow to a 50 cow dairy? Still this remains a marginal analysis. In fact, adding 10 cows to a 50 cow dairy, or 50 cows, or even adding 500 cows to a 50 cow dairy are all still marginal analyses. The breadth of costs that have to be considered may expand the analysis required, but the conceptual framework remains the same. Cows and feed and vaccine and paper towels are passed into the bubble and milk and manure and culls pass back out.

5. adding one more person to the farm's labor force? By now this should be getting boring. Obviously this is marginal as well. In fact, the manager of a dairy makes **NO** decision that is not a marginal decision. There are no average decisions. They are all marginal decisions! For that reason, making decisions based on the farm's current average performance is fraught with the risk of being flawed in its conclusion.

In the end, the average financial outcome (the farm's and banker's goal) on a dairy is the result of a series of marginal economic decisions. Each day, the manager makes a myriad of decisions, each of which has its own particular marginal outcome. The sum of all of those marginal outcomes are what make up the average result.

Marginal Examples:

1. What is the marginal value of an extra pound of dry matter intake?

If a cow eats an additional pound of dry matter intake, she consumes additional energy. Presuming that the ration is balanced and that energy intake will drive milk production, then the extra (marginal) dry matter intake will result in marginal milk production. There are no other significant costs involved; the mortgage, teat dip, vaccine, tractor repairs, etc.

will not be affected by the marginal change in the cow's production. Marginal profit is simply the revenue from marginal milk production minus the cost of the additional dry matter intake. Table 1 details this at a set price for milk and feed. At $12.50 per cwt for milk and 7.5 cents per pound of dry matter for feed, the marginal value of an additional pound of dry matter intake is 22 cents per day. In a 100 cow herd milking an average of 300 days per year, the profit from increasing each cow's intake by one pound each day is $6,614 per year, or $66 per cow additional profit.

What does this mean? Over the past decade in the upper Midwest, the average dairy farmer has earned a profit of roughly $300 to $400 per cow per year. An additional $66 per cow is a 16% to 20% raise in take home income for the average farmer and their family. For half of your clients (the ones below average) it means even more. All for just coaxing their cows to eat one more pound of dry matter per day.

2. What is the marginal value of an extra pound of milk production?

Using a similar analysis as in Table 1, Table 2 shows that a marginal pound of milk production is worth 9.3 cents at $12.50 / cwt and 7.5 cents / lb. dry matter intake. Profit from marginal milk is nearly 10 dollars per hundredweight! (Even at $12.50 milk!) An extra (marginal) pound of milk from each cow each day in a 100 cow dairy is worth $2,826 profit per year. Marginal milk not only need not "pay" the mortgage, etc. it also need not "pay" to maintain the cow. The maintenance feed costs necessary to keep the cow alive (separate from making milk) is thus "diluted" by each successive marginal pound of milk that a cow produces.

It should be noted that this marginal production is extra milk from an existing cow. In general, this is the most profitable milk available on a dairy: *more milk from an existing cow*. Only the marginal feed costs need to be accounted for in the marginal analysis. The next most profitable milk is additional milk from additional cows in the same facilities and using the same labor and equipment. Here only marginal feed and the marginal costs of purchasing the cow need to be considered. From there the next most profitable milk follows logically: milk from additional cows in new facilities using the same milking system, milk from additional cows in new facilities with a new system, etc. The most important point is that every farm has some potential to increase milk per cow in their existing cows, and it is precisely that milk that is most profitable.

Viewed from the other direction, if conditions are such that marginal milk is worth $9 per cwt in profit, then the farmer can afford to spend up to $9.00 per cwt of marginal milk to get it. Obviously the dairyman should not spend the whole $9.00; they want to spend less than that so that they profit from their investment. This answers the first scenario. If the salesman will guarantee a response to their product (and one can actually measure and account for the effect), then the farmer should be willing to pay $6.00 for the extra milk, knowing that the dairy will still make $3.00 profit per cwt after paying the salesman ($9.00 - $6.00 / cwt). To distort the old joke, the dairyman can, in fact, be losing on every pound of milk shipped and make it up in volume!

The dairyman in the second scenario who is limiting feed in the bunk is likely also limiting dry matter intake. At 12 cents per pound for milk and 3 cents per pound for the feed to make it, the dairyman could "waste" nearly 3 out of every 4 extra pounds of feed fed to his clean bunk and come out ahead.

3. What is the effect of milk production on average feed costs per hundredweight?

Using a simple chart, one can quickly estimate a farm's income over feed costs at various production levels (Table 3). First, take the cost of feeding a dry cow ($1.50 in the example) as the cost of providing the nutrients necessary to maintain the cow in the absence of any milk production. Next determine the cost of feeding a cow making 100 pounds of milk ($4.00 in the example). The difference ($4.00 - $1.50 = $2.50) is the cost of the milk production, or 2.5 cents for the feed per pound of milk produced. This number is generally consistent with the estimate in Table 2 of 3.2 cents in feed costs per pound of milk. When this is done on many dairies, one generally arrives at a value of 2.5 to 3.25 cents as the cost of feed for marginal milk production. Given the two feed costs numbers (cost for a dry cow and cost for a 100 pound producer) and the price of milk, one can quickly calculate the rest of Table 3.

Consider the cow making 50 pounds of milk, for example. It costs $1.50 for maintenance, plus 50 x 2.5 cents (= $1.25) to support her production. Total feed costs are thus $2.75 per day. $2.75 divided by 50 pounds of milk results in a cost of 5.5 cents of feed cost per pound of milk for the cow making 50 pounds total per day. Her feed cost per hundredweight of milk is thus $5.50. At $12.50 per cwt for her 50 pounds of milk, she earns $6.25 per day in revenue. Subtracting the $2.75 in feed costs from her income of $6.2 leaves $3.50 of income over feed costs per day.

As something of an aside, it is interesting to consider whether a dairyman should dry off a cow making 25 pounds of milk. Most dairymen would use common sense and dry her off. Assume that she was late in conceiving, but will be retained in the herd and that her "place in the milking order" is not needed for another cow. From Table 3, she makes $1.00 income over feed cost per day. If dried off, she costs $1.50 in maintenance feed costs. The net effect of drying her off is a loss of $2.50 per day!

The row labeled "feed costs per hundredweight of milk" in Table 3 is worth careful examination. In this example, every cow, regardless of production level, is being fed the exact same ration at the exact same cost, mouthful by mouthful. How can the feed cost per hundredweight be so different if they are eating the same feed? The cow making 25 pounds of milk has a feed cost/cwt of $8.50, the cow at 50 pounds has a feed cost/cwt of $5.50, at 75 pounds $4.50, and at 100 pounds $4.00! If the same feed fed to different cows results is such different average feed costs per hundredweight, what, then, is the value of knowing a dairy's <u>average</u> feed cost per hundredweight? What does the number tell you?

Average cost per ton of soybean meal may be a useful number in determining if the farm is doing an efficient job in purchasing feed. Average feed cost per hundredweight, in contrast, is so confounded by the herd's production that it is misleading at best as a measure of the farm's efficiency in feed procurement and delivery. Feed cost per hundredweight on most dairies is something of a foregone conclusion. If the herd is producing poorly, the average feed cost per hundredweight will inevitably be high. If the herd is filled with high producers, the average feed cost per hundredweight will inevitably be low. Average feed cost per hundredweight is not the best monitor of how well a farm controls its feed purchase costs. Calculations based on the benchmarks of "good cost control" versus "poor cost control" farms can show that more than one half of the apparent losses to herds attributed to poor cost control in purchasing feeds are not, in fact, due to the price of the feed purchased, but are due instead to the low production and failure to dilute out maintenance costs.

Clearly, the most effective way to reduce average feed costs per hundredweight is to feed and manage cows so that that they are shifted to the right in Table 3, that is so that they produce more milk. The marginal cost of feed is so small (2.5 to 3.25 cents per pound of milk) compared to the marginal value of milk (10 to 16 cents per pound) that it is essentially always a good idea to feed more to make more milk. When the milk price is low, the proper behavior is to try to make more milk per cow. When the milk price is high, the proper behavior is to try to make more milk per cow. It is pretty simple.

While it is certainly true that dairy farmers should try to purchase their feeds as cost effectively as possible (buying feeds cheaply), it is probably rarely wise to buy poor feeds because their price is low (buying cheap feeds). The impact of marginal milk on profit is simply to great to forego. Veterinarians need to help their clients refocus away from feed cost savings and toward increased production and profit.

4. Does moving cows to a lower production group save money by reducing feed costs?

Group feeding cows by production group is so widely practiced in the dairy industry that is seems like common sense that it must be wise. If it costs an average of $4.00 per day to feed a cow in the high group and $3.00 per day in the low group, it would seem only to make sense to move cows to the cheaper ration as their production declines in later lactation. If the average cow in a 100 cow dairy spends on average only the last 100 days in the low group, the savings should be $10,000 per year in feed costs (100 cows, 100 days each, $4.00 - $3.00 = $1.00 per day). This may not be true. Several presumptions lie behind the preceding analysis. First, it is presumed that the cow, once moved to the lower cost ration, will continue to produce the same amount of milk that she would have made had she stayed on the more expensive ration, or said another way, that she would have stayed on the same lactation curve on the cheaper ration. If this were true, and farmer plans to move the cow on Monday, one could ask why not on Sunday? If a dairyman can move a cow from an expensive ration to a cheaper one without affecting production, why not do it sooner? Using this logic, one would push the move date earlier and earlier in the lactation until either the whole herd is fed the cheaper ration (a mistake)

or one is forced to admit that the only time one should move a cow to a cheaper ration is when one expects the production to decline. Presumably, production losses in a moved cow should be worth less than the feed savings.

As expected, the analysis based on average feed cost per cow in the two groups is flawed. The proper analysis should be based on a marginal cow, that is the one that will be moved. Some assumptions are needed for this analysis as well. First, the analysis assumes that the cow, once moved, will continue to eat the same amount of dry matter as before the move. This may be optimistic, since the social effects and the likely higher NDF of the cheaper ration may drive intakes down, but for this analysis we will remain optimistic about intakes. Further, it is assumed that any impact on production as a result of the move will be sustained for the rest of the lactation, i.e. that the cow, once shifted to a lower lactation curve will remain on that curve. Last, it is assumed that milk production will be driven by energy intake, and that the new, cheaper ration is adequate in the other nutrients to support the milk production provided for by the energy intake.

Table 4 presents the analysis for a cow consuming 42 pounds of dry matter on the day of the move. The expensive ration costs 8.3 cents per pound of dry matter and the cheaper ration costs 7.5 cents, or roughly 10 percent less per mouthful. The expensive ration contains 0.78 Mcal per pound of dry matter, the cheaper 0.72 Mcal. As Table 4 shows, the move (presuming no change in dry matter intake) does indeed save $3,500 per year in feed costs. However, the reduction in energy intake, if fully translated into reduced milk production, causes a loss of $9,545 in milk revenue. The net result of moving the 100 cows in the herd is a **loss** of approximately $6,000. This is a far financial distance from the expected $10,000 in savings based on the average feed costs in the two groups.

If asked, most dairymen will concede that cows decline in production when moved to a cheaper, less energy dense ration. In the example case, if the cow loses more than 2.8 pounds of production, the value of any feed cost savings are wiped out. Again, it simply does not pay to try to reduce feed costs at the expense of production. The marginal value of milk is too much greater than the marginal costs of feed. Most very high producing herds (more than 25,000 pounds per cow), when asked, will admit that they do not really have a low group ration. They may feed cows as groups (heifers, breeding cows, etc.), but the driving motive is rarely because they are trying to reduce feed costs.

It is probably safe to say that the overwhelming majority of dairies in the United States limit feed their milking cows. Usually this is done out of ignorance and out of the misguided attempt to reduce average feed costs by reducing the cost of feed fed to a given cow on a given day. Dairymen and professional nutritionists alike focus on the cost of feeds, tweak their linear programs, limit feed delivery or access to the bunk, or feed poor, cheap feeds in an effort to reduce average feed costs per hundredweight. The individual dairyman would be well served to feed more and better, even more expensive feeds per pound of dry matter, if the result is increased production per cow. It may very well be that there is reason to group feed cows in order to reduce costs of protein, or expensive additives. **It is unlikely, however, that it is ever financially wise to deliberately limit**

the energy intake of a milking dairy cow. The exceptions, like particular individual very fat cows, do not outweigh the enormous losses that dairies incur by trying to "feed cheaply". Marginal milk is simply too valuable.

Conclusion

The concept of marginality and marginal decision making is key to making the right decisions on dairies. In some respects, veterinarians are comfortable in thinking in marginal terms, since each therapeutic decision in an individual cow is a marginal decision in economic terms. Dairy farmers and their advisors can be led astray, however, when they begin to base the next marginal economic decision on the overall historic average performance in a herd or the industry. Management practices that are widespread and well accepted may not be the best economic choices. Veterinarians who advise dairy producers have a responsibility to think freshly (and marginally) about the standards of management to which we have all become accustomed.

Many dairy farmers forego very significant profit opportunities in the false pursuit of reducing the costs of inputs. By focusing on the costs of inputs and not the inputs' marginal impact on revenue (milk) and therefore profit, many dairy producers box themselves into a cycle of poor investment decisions, poor profitability, and a poor lifestyle. Veterinarians, properly prepared and with the proper conceptual basis, can help them break out of that cycle and improve their clients' livelihoods and lives.

Table 1

MARGINAL VALUE OF EXTRA DRY MATTER INTAKE

28-Mar-98

	2.00	lbs feed added "as fed"
	50%	percent dry matter
	1.00	lbs of added dry matter
	0.78	energy/lb in dry matter
	0.78	added energy: Mcal
	0.33	energy per lb of milk
	2.36	lbs of milk supported
$	12.50	price of milk per cwt
$	0.295	added milk revenue/cow/day
$	0.038	feed cost per lb as fed
$	0.075	added feed cost/cow/day
$	0.22	added profit/cow/day
	100	cows in herd
	300	days of milk per year
$	6,614	extra profit per year for herd

Table 2

Income over Feed Cost of Marginal Milk

1.0	extra pounds of milk
$ 12.50	price of milk per hundredweight
$ 0.125	price of milk per pound
$ 0.125	additional revenue from milk
0.33	energy needed to support a marginal pound of milk (Mcal)
0.33	energy needed to support the additional milk
0.78	energy per pound of dry matter intake in the ration
0.42	extra pounds of dry matter needed
$ 0.075	cost of ration per pound DMI
$ 0.032	extra cost of feed to support milk production
$ 0.093	income over feed cost from added milk
$ 9.33	**income over feed costs / hundredweight for marginal milk**
83	cows in the herd in milk each day
$ 7.74	increased income over feed costs per day
$ 2,826	increased income over feed costs per year

Table 3

Calculation of the income over feed costs at various levels of production on a dairy.

	costs and revenue by production level				
production (lbs)	dry	25	50	75	100
maintenance feed costs	$ 1.50	$ 1.50	$ 1.50	$ 1.50	$ 1.50
feed cost for the milk produced	$ -	$ 0.63	$ 1.25	$ 1.88	$ 2.50
total feed cost per day		$ 2.13	$ 2.75	$ 3.38	$ 4.00
feed cost per lb milk		$ 0.085	$ 0.055	$ 0.045	$ 0.040
feed cost per 100 lbs milk		$ 8.50	$ 5.50	$ 4.50	$ 4.00
milk revenue		$ 3.13	$ 6.25	$ 9.38	$ 12.50
income over feed costs		$ 1.00	$ 3.50	$ 6.00	$ 8.50

feed cost per additional lb milk	$ 0.025
milk price / cwt	$ 12.50
milk price per pound	$ 0.125
profit per pound of additional milk	$ 0.100
profit per 100 lbs additional milk	$ 10.00

Table 4

Does it pay to move a cow from a high cost ration to a lower cost ration?

	42	cow's current dry matter intake	
$	12.50	price of milk per cwt	
	100	cows in the herd that will move to the lower group per year	
	100	days the cows will spend in the lower group if moved	
High Cost Group			Lower Cost Group
$	**4.00**	cost to feed the average cow in the group	$ **3.00**
	48	average dry matter intake in the group (lbs)	**40**
$	0.083	cost of ration per pound of dry matter	$ 0.075
$	3.50	ration cost eaten by the cow to be moved	$ 3.15
$	**0.35**	savings from reduced feed costs per cow per day	
$	**35.00**	savings per cow per lactation	
$	**3,500**	savings in the herd per year	
	0.78	NE(l) in the ration	**0.72**
	32.8	energy intake by the move cow	30.2
	2.5	difference in energy intake after move (Mcal)	
	0.33	energy requirement per pound of milk	
	7.6	pounds of milk no longer supported by ration	
$	**0.95**	value of milk not produced	
$	**95.45**	lost income per cow per lactation	
$	**9,545**	lost income for the herd per year	
$	**(0.60)**	loss per cow per day from the move	
$	**(60.45)**	loss per cow per lactation	
$	**(6,045)**	**Net profit (loss) from the move**	

The expected savings in feed costs would be wiped out if milk production dropped by as little as 37% of the prediction. In this case, by as little as 2.8 pounds per day.