Making Cents out of Research: From the Lab Bench to the Farm Gate

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Take Home Messages

- Research creates new knowledge or a better understanding of biological processes involved in the production of high quality milk.
- Determining what research can be applied to an individual farm is specific to the farm.
- Change should impact areas of need and opportunity.
- Making changes based on research findings requires confidence in the research.
- Making changes requires a system that allows for measurable impacts and outcomes.
- Changes that result from the application of research based "technology" should fit with the goals of the dairy farm's mission and business plan.

Introduction

The objective of this paper is to frame how one uses the new knowledge gained from the collective research work that is being summarized and presented during the 2005 Western Canadian Dairy Seminar. In other words, the objective of this paper can be paraphrased as the general theme of this year's seminar: "'Learning' Today for Tomorrow's Future". In the land grant university system in the United States and in the design of Agriculture and Agri - Food Canada, agricultural research centers were established to conduct problem solving research. In fact, much of the research is created from a flow that originates as problems on farms becoming a "from farm gate to lab bench back to the farm gate". The design of the research is to discover answers to important problems being experienced on dairy farms.

The outcome of this discovery research is new knowledge. Some research focuses on defining the basic biological relationships within cells, between cells, within organs, between organs. Other research evaluates the different outcomes of the biological responses of the whole to experimental treatments (or controlled change). Broadly, we often refer to these two types of research as basic research or applied research. In many cases the two are actually linked – basic research being conducted to better understand a "whole animal response" to a specific circumstance. Or, applied research being conducted in an effort to control, limit or expand a basic response to the benefit of the animal or plant we are managing. Successful research, be it applied or basic research, is conducted in such a way that the sources of variation within the parameter being measured are eliminated, minimized, or controlled so they can be accounted for in the data are analyzed. These things are controlled by the design of the project and the assigning of animals to experimental treatments.

For instance, in conducting a nutrition study, a control diet would not be fed to only first lactation heifers with the treatment diets fed to higher producing mature cows. Obviously the treatment diet would likely have an advantage when it is really the age of the cow that causes the differences between treatment groups. Similarly, treatment diets would not be fed during June, July and August with the control diet fed during the more comfortable months of October, November and December. This type of experimental design would also lead to erroneous conclusions because the administration of the treatments were confounded with a factor (like age or season) that also causes variation in the parameter being measured (milk production). The role of the presenters at this conference is to help summarize research findings from many sources and to provide for you a take home message that is based on their individual knowledge and research findings that they have full confidence can be repeated with similar results.

As with any conference of this type, the participants attend with the expectation of learning something new that will help them do their business better. Conferences, producer meetings and workshops share a common objective – disseminate knowledge to allow those attending to do business more efficiently and hopefully more profitably than before attending the conference. But how do you know if what you are learning will be of any benefit? In other words, what do you try and what do you decide not to try?

A successful learning experience creates momentum for change. You should become interested in using new information successfully on your farm (or the farms you work with). But how does one decide what to use and what not to use?

First, determine what is the reason to try something new or different? Does it address a need you have on your dairy farm or on a dairy farm you consult

with. Will this change lead to a profitable outcome? Can you measure accurately the outcome of the change? These are the points that should be raised in considering using your new knowledge.

Current business management and marketing literature promotes the concept of a SWOT analysis. Weinand and Conlin (2003) described how SWOT was used by dairy farm diagnostic teams. SWOT represents an analysis of the business that describes the Strengths and Weaknesses within a business as well as the Opportunities and Threats. The Strengths and Weaknesses are things about the business that the owner/manager controls. The Opportunities and Threats are those factors that can impact the business that are not necessarily controlled by the business, but could affect the business – i.e. the price of milk or the costs of supplies such as fuel, electricity and bedding. A SWOT analysis should identify the management areas that have the greatest opportunity of for improvement. These management weaknesses once identified should be "ranked" according to importance to the dairy farm business. The ranking accounts for which weakness creates the largest loss of income or the causes the greatest expense. Some managers also use a ranking that indicates how quickly change can be made in resolving the problem. For instance, a problem with concrete flooring may take more time and investment to correct than an easier change in how long the TMR is mixed to assure adequate mixing without excessive particle size reduction. In a recent popular press article Dr. Greg Bethard, a dairy management consultant from Virginia reminds farm managers and consultants the importance of monitoring things that can be accurately and economically measured. He also points out that the parameters that he calls "monitors" should impact profit and be affected as little as possible by time factors.

So when asked to prepare a presentation on using research, the idea starts with having good information that can be used to evaluate the current management on a farm. By identifying the Strengths, farm managers recognize the positive aspects of the operation and avoid making changes in strengths. The identification of Weaknesses allows us to make changes that can benefit the operation by improving profit (increasing income and/or reducing expenses). The program committee more specifically asked that cases be presented where research results were applied in solving a problem. The following case studies are actual dairy farm scenarios that were addressed using research to diagnose the problem and/or to determine the appropriate change.

■ Cows Just Aren't Milking…

The farm manager was disappointed in the milk production his family's herd of registered Holstein cows was achieving. The herd typically averaged a bulk tank average around 38 kg/d. The farm manager provided me DHIA summary

records and a copy of the diet being fed to the milk cows. The DHIA records revealed the cows had good udder health (SCC was less than 300,000 cells per ml). The herd had longer days open than optimal, but the manager indicated they held some cows open to use as donor cows in embryo transfer which skewed the average. Indeed, the reproduction profile was pretty consistent with the previous year. The diet was a corn silage, alfalfa haylage, alfalfa hay diet. The grain mix was formulated so that the total diet contained about 18% crude protein (DM basis).

The grain mix contained a high proportion of fibrous by-product feeds. The use of these feeds was designed to reduce the risk of ruminal acidosis. This was especially a concern on this farm given the grain portion of the diet was fed during milking in the milking parlor. An analysis of the diet revealed the high concentration of fibrous by-product feeds had created a diet that contained 28% non-fiber carbohydrate (NFC). This NFC level was evaluated using a summary of research published by Nocek and Russell that showed the optimal range of NFC and found to be much lower than the optimal range. The diet was reformulated to include more steam flaked corn and less of the fibrous by-product feeds. The adjustment was made to allow NFC to be increased to 32%. The increase was not larger for two reasons. First, a dramatic increase in corn to increase NFC could predispose the cows to acidosis. Second, the cows were being fed the grain twice daily in the parlor and the lower NFC was chosen to avoid “slug feeding” of a high starch concentrate. The delivery of the new load of feed with a higher NFC created an increase of 3.0 kg/cow per day within the week. All other components of the diet stayed the same including the forage component and the feeding regime.

The change did result in an increase feed cost of $0.05 per cow per day. However, the income from the sale of milk was $0.66 per cow per day (3.0 kg/d @ $0.22/kg). The additional milk would also add production costs associated with cooling and hauling the additional milk. A conservative estimate of the increase in net income for the higher milk production would be $0.30 per cow per day or for this 225 cow herd, an annualized increase of $24,500 for the herd.

■ Twisted Stomachs – Displaced Abomasum in Fresh Cows

A farm manager reported an incidence rate of displaced abomasums of almost 35% with most cows suffering from the problem during the first two weeks of lactation. Several consultants had made visits to the operation and expressed concern with the length of chop of the forage. The farm was fortunate to have excellent quality forages and mixing in the TMR mixer resulted in decreased particle size. The recommendation was to add wheat straw to the fresh cow

diet as well as a small amount to the diet fed to the close-up dry cows. After the initial 2 pounds of straw was added, the next few cows that calved experienced DA that required surgical intervention. Additional straw was added to both the close-up and the fresh cow diets. With the next few cows that calved, there was still a problem with twisted stomachs.

A closer evaluation of the problem appeared to be linked with the transition cow protocol as a whole rather than the diets fed to the fresh cows. The close-up cows were being fed a grass hay based diet with modest levels of supplemental grain. The energy intake was limited both by the high level of forage NDF and the low level of supplemental energy from the grain. It seemed that adding straw to the diet to increase "physical" or effective fiber was confounding the problem. Many dairy producers associate displaced abomasums with inadequate long forage fibers. However, the review reported by Shaver (1997) suggests that displaced abomasums are associated with a wide array of nutritional risk factors associated with rumen motility. In this case, the large change in the consumption of rapidly fermentable carbohydrates as the cows left the close-up pen and were moved to the fresh cow diet could have been contributing to the DA problems by creating ruminal acidosis. Additionally, the high fiber diet fed pre-partum was also limiting energy intake during late gestation and the cows were experiencing a severe decrease in dry matter intake. This severe decrease in energy balance was resulting in sub-clinical ketosis during the pre-partum period just prior to calving. Shaver (1997) reported that low feed intake and uncomplicated ketosis as well as milk fever could contribute to DA. A change in both the pre-partum diet that incorporated some corn silage and increased grain as well as reformulating the fresh cow diet to promote feed intake and healthy rumen fermentation during transition dramatically reduced the incidence of DA.

■ Milk Fever in Mid to Late Lactation Cows

The veterinarian called with a question about a client herd with an unusual problem with hypocalcaemia or milk fever. The veterinarian had treated several cows between 150 and 200 days in milk for milk fever. The animals responded well to treatment confirming for the veterinarian the diagnosis. The producer did have one animal die before she was treated and samples had been sent to the diagnostic lab for analysis. The theory or thinking of those involved in helping the producer solve the problem included a toxin that was preventing the dietary calcium from being absorbed to a severe imbalance of minerals leading to abnormal calcium absorption.

The diagnostic lab discovered the muscle tissue collected from the cow that died had small calcification deposits. This suggested that the calcium was being absorbed but was being deposited in muscle tissue and was therefore unavailable for utilization by the animal. Miller (1979) reported in his book on

Dairy Cattle Feeding and Nutrition, that “Very high levels of Vitamin D cause high blood plasma calcium, deposition of calcium in the many soft tissues including the heart and arteries, and other pathological changes which can become sufficiently severe to cause death.”

The consulting veterinarian began to collect the feed tags from all of the ingredients being fed to the cows. Unknowingly, the producer was feeding over 20 – fold more Vitamin D than required. Several “small inclusion” products that were being added to the diet contained supplemental Vitamin D; this was in addition to the Vitamin D being fed in the vitamin – mineral pre-mix. A quick adjustment of the Vitamin D level in the diet resolved the problem.

Why Not Change

Research scientists at university and government agency research labs as well as those in private industry are working to identify solutions to challenges faced by the high producing dairy cow. The dairy producer has an untold number of tools and options available to make significant changes and improvements on their farm. However, change is sometimes slow.

Work reported by Weinand and Conlin (2003) at the University of Minnesota found that recommendations made by consultant teams were not implemented for various reasons. Producers reported Time (48%) and Money (39%) as the constraints most limiting their ability to implement recommended changes. Furthermore, facility constraints (34%) and limited labor (26%) also reduced the likelihood of recommendations being implemented. There are indeed reasonable explanations that limit the amount of change that can occur in response to new knowledge gained at educational meetings, seminars and conferences.

So, how should a farm manager decide what to change? During the 2005 Western Canadian Dairy Seminar, a variety of topics affecting several management areas will be discussed. What do we change when we get back to the farm? For allied industry representatives, what information do you share with producer clients in an effort to help them make appropriate changes?

Some Guidelines

- Consider changes that address a production weakness identified by a SWOT analysis.
- Consider the economic impact of the change (positive and negative).

- Make one change at a time otherwise you can't be sure what worked and what didn't work.
- Change things that can be measured accurately and monitored closely.
- Re-evaluate changes after a period of time that allows for response.

The modern world is information reach. Successful entrepreneurs navigate the flow of information, using new knowledge from reputable sources to make changes as early adopters. The successful business manager also minimizes risk of making unsuccessful changes by having all of the knowledge necessary to make good choices with low risk of failure. Hopefully this conference will equip you with a new knowledge on things meaningful to improving your business. Thus, the conference experience becomes "Learning Today for Tomorrow's Future."

References

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