The 31st Annual

SOUTH WESTERN ONTARIO DAIRY SYMPOSIUM

Thursday, February 20, 2014

Woodstock Fairgrounds

WOODSTOCK

The 31st Annual
SOUTH WESTERN ONTARIO
DAIRY SYMPOSIUM

THE PROGRAM

9:00 a.m.	Exhibits Open, Registration and Coffee
10:20 a.m.	Welcome
10:30 a.m.	"Managing Health and Reproduction with Precision Tools" **Dr Jeff Bewley**, University of Kentucky
11:00 a.m.	"A Personal Story of Adversity and Adventure" **Leona Dargis**
12:00 noon	Roving Hot Lunch (featuring novel and Canadian dairy products)
1:30 p.m.	"Is Shredlage the New Corn Silage?" **Dr. Randy Shaver**, University of Wisconsin
2:15 p.m.	"The Five Principles of Sustainable Food - How do Ontario dairy farms measure up for today and tomorrow?" **Crystal Mackay**, Farm and Food Care Ontario
3:00 p.m.	Speak Your Mind! (open microphone session sponsored by Gay Lea Foods)
3:30 p.m.	Adjournment
4:00 p.m.	Exhibits Close

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MANAGING HEALTH AND REPRODUCTION WITH PRECISION TOOLS

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Take Home Messages

- Precision Dairy Farming is the use of technologies to measure physiological, behavioral, and production indicators on individual animals to improve management strategies and farm performance.
- Many Precision Dairy Farming technologies, including daily milk yield recording, milk component monitoring, pedometers, automatic temperature recording devices, milk conductivity indicators, automatic estrus detection monitors, and daily body weight measurements, are already being utilized by dairy producers.
- Other theoretical Precision Dairy Farming technologies have been proposed to measure jaw movements, ruminal pH, reticular contractions, heart rate, animal positioning and activity, vaginal mucus electrical resistance, feeding behavior, lying behavior, odor, glucose, acoustics, progesterone, individual milk components, color (as an indicator of cleanliness), infrared udder surface temperatures, and respiration rates.
- The main objectives of Precision Dairy Farming are maximizing individual animal potential, early detection of disease, and minimizing the use of medication through preventive health measures.
- Perceived benefits of Precision Dairy Farming technologies include increased efficiency, reduced costs, improved product quality, minimized adverse environmental impacts, and improved animal health and well-being.
- Real time data used for monitoring animals may be incorporated into decision support systems designed to facilitate decision making for issues that require compilation of multiple sources of data.
- Technologies for physiological monitoring of dairy cows have great potential to supplement the observational activities of skilled herdspersons, which is especially critical as more cows are managed by fewer skilled workers.
- The economic implications of technology adoption must be explored further to increase adoption rates of Precision Dairy Farming technologies.

Introduction

Across the globe, the trend toward fewer, larger dairy operations continues. Dairy operations today are characterized by narrower profit margins than in the past, largely because of reduced governmental involvement in regulating agricultural commodity prices. Consequently, small changes in production or efficiency can have a major impact on profitability. The resulting competition growth has intensified the drive for efficiency resulting in increased emphasis on business and financial management. Furthermore, the decision making landscape for a dairy manager has changed dramatically with increased emphasis on consumer protection, continuous quality assurance, natural foods, pathogen-free food, zoonotic disease transmission, reduction of the use of medical treatments, and increased concern for the care of animals. These changing demographics reflect a continuing change in the way in which dairy operations are managed. In large part, many of these changes can be attributed to tremendous technological progress in all facets of dairy farming, including genetics, nutrition, reproduction, disease control, and management. W. Nelson Philpot (2003) captured this change effectively in describing modern dairy farms as "technological marvels." Conceivably, the next "technological marvel" in the dairy industry may be in Precision Dairy Farming.

What is Precision Dairy Farming?

Precision Dairy Farming is the use of technologies to measure physiological, behavioral, and production indicators on individual animals to improve management strategies and farm performance. Many Precision Dairy Farming technologies, including daily milk yield recording, milk component monitoring (e.g. fat, protein, and SCC), pedometers, automatic temperature recording devices, milk conductivity indicators, automatic estrus detection monitors, and daily body weight measurements, are already being utilized by dairy producers. Eastwood et al. (2004) defined Precision Dairy Farming as "the use of information technologies for assessment of fine-scale animal and physical resource variability aimed at improved management strategies for optimizing economic, social, and environmental farm performance." Spilke and Fahr (2003) stated that Precision Dairy Farming, with specific emphasis on technologies for individual animal monitoring, "aims for an ecologically and economically sustainable production of milk with secured quality, as well as a high degree of consumer and animal protection." With Precision Dairy Farming, the trend toward group management may be reversed with focus returning to individual cows through the use of technologies (Schulze et al., 2007). Technologies included within Precision Dairy Farming range in complexity from daily milk yield recording to measurement of specific attributes (e.g. fat content or progesterone) within milk at each milking. The main objectives of Precision Dairy Farming are maximizing individual animal potential, early detection of disease, and minimizing the use of medication through preventive health measures. Precision Dairy Farming is inherently an interdisciplinary field incorporating concepts of informatics, biostatistics, ethology, economics, animal breeding, animal husbandry, animal nutrition, and engineering (Spilke and Fahr, 2003).

Potential Benefits of Precision Dairy Farming

Perceived benefits of Precision Dairy Farming technologies include increased efficiency, reduced costs, improved product quality, minimized adverse environmental impacts, and improved animal health and well-being. These technologies are likely to have the greatest impact in the areas of health, reproduction, and quality control (de Mol, 2000). Realized benefits from data summarization and exception reporting are anticipated to be higher for larger herds, where individual animal observation is more challenging and less likely to occur (Lazarus et al., 1990). As dairy operations continue to increase in size, Precision Dairy Farming technologies become more feasible because of increased reliance on less skilled labor and the ability to take advantage of economies of size related to technology adoption.

A Precision Dairy Farming technology allows dairy producers to make more timely and informed decisions, resulting in better productivity and profitability (van Asseldonk et al., 1999b). Real time data can be used for monitoring animals and creating exception reports to identify meaningful deviations. In many cases, dairy management and control activities can be automated (Delorenzo and Thomas, 1996). Alternatively, output from the system may provide a recommendation for the manager to interpret (Pietersma et al., 1998). Information obtained from Precision Dairy Farming technologies is only useful if it is interpreted and utilized effectively in decision making. Integrated, computerized information systems are essential for interpreting the mass quantities of data obtained from Precision Dairy Farming technologies. This information may be incorporated into decision support systems designed to facilitate decision making for issues that require compilation of multiple sources of data.

Historically, dairy producers have used experience and judgment to identify outlying animals. While this skill is invaluable and can never be fully replaced with automated technologies, it is inherently flawed by limitations of human perception of a cow's condition. Often, by the time an animal exhibits clinical signs of stress or illness, it is too late to intervene. These easily observable clinical symptoms are typically preceded by physiological responses evasive to the human eye (e.g. changes in temperature or heart rate). Thus, by identifying changes in physiological parameters, a dairy manager may be able to intervene sooner. Technologies for physiological monitoring of dairy cows have great potential to supplement the observational activities of skilled herdspersons, which is especially critical as more cows are managed by fewer skilled workers (Hamrita et al., 1997).

Precision Dairy Farming Examples

The list of Precision Dairy Farming technologies used for animal status monitoring and management continues to grow. Because of rapid development of new technologies and supporting applications, Precision Dairy Farming technologies are becoming more feasible. Many Precision Dairy Farming technologies including daily milk yield recording, milk component monitoring (e.g. fat, protein, and SCC), pedometers, automatic temperature recording devices, milk conductivity indicators, automatic estrus detection monitors, and daily body weight measurements are already being utilized by dairy producers. Despite its seemingly simplistic nature, the power of accurate milk weights should not be discounted in monitoring cows, as it is typically the first factor that changes when a problem develops (Philpot, 2003). Other theoretical Precision Dairy Farming technologies have been proposed to measure jaw movements, ruminal pH, reticular contractions, heart rate, animal positioning and activity, vaginal mucus electrical resistance, feeding behavior, lying behavior, odor, glucose, acoustics, progesterone, individual milk components, color (as an indicator of cleanliness), infrared udder surface temperatures, and respiration rates. Unfortunately, the development of technologies tends to be driven by availability of a technology, transferred from other industries in market expansion efforts, rather than by need. Relative to some industries, the dairy industry is relatively small, limiting corporate willingness to invest extensively in development of technologies exclusive to dairy farms. Many Precision Dairy Farming technologies measure variables that could be measured manually, while others measure variables that could not have been obtained previously.

Investment Analysis of Precision Dairy Farming Technologies

Today's dairy manager is presented with a constant stream of new technologies to consider including new Precision Dairy Farming technologies. Galligan and Groenendaal (2001) suggested that “the modern dairy producer can be viewed as a manager of an investment portfolio, where various investment opportunities (products, management interventions) must be selected and combined in a manner to provide a profit at a competitive risk to alternative opportunities.” Further, dairy managers must consider both biological and economic considerations simultaneously in their decisions. Traditionally, investment decisions have been made using standard recommendations, rules of thumb, consultant advice, or intuition. Thus, more objective methods of investment analysis are needed (Verstegen et al., 1995).

Adoption of sophisticated on-farm decision-making tools has been scant in the dairy industry to this point. Yet, the dairy industry remains a perfect application of decision science because: (1) it is characterized by considerable price, weather, and biological variation and uncertainty, (2) technologies, such as those characteristic of Precision Dairy Farming, designed to collect data for decision making abound, and (3) the primary output, fluid milk, is difficult to differentiate, increasing the need for alternative means of business differentiation. In “Competing on Analytics: The New Science of Winning,” Davenport and Harris (2007) pose that in industries with similar technologies and products, “high performance business processes” are one of the only ways that businesses can differentiate themselves.

Investment analyses of information systems and technologies are common within the general business literature (Bannister and Remenyi, 2000, Lee and Bose, 2002, Ryan and Harrison, 2000, Streeter and Hornbaker, 1993). However, dairy-specific tools examining investment of Precision Dairy Farming technologies are limited (Carmi, 1992, Gelb, 1996, van Asseldonk, 1999), though investment analyses of other dairy technologies abound (Hyde and Engel, 2002). Empirical comparisons of technology before or after adoption or between herds that have adopted a technology and control herds that have not adopted are expensive and biased by other, possibly herd-related differences. As a result, the normative approach, using simulation modeling, predominates in decision support models in animal agriculture (Dijkhuizen et al., 1991). Investing in new agricultural technologies is all too often a daunting and complex task. First, the standard approach using the Net Present Value is often misleading because it does not adequately account for the underlying uncertainties. Second, the incremental costs and benefits of new technologies require complex interactions of multiple variables that are often non-linear and not intuitive. The complexities surrounding investment in Precision Dairy Farming technologies is one example of this type of complex decision.

Ward (1990) listed three benefits to investment in technology: 1) substitutive, replacing human power with machine power, 2) complementary, improving productivity and employee effectiveness through new ways of accomplishing tasks, and 3) innovative, obtaining a competitive edge. In addition to impacts on production, many technologies may also change milk composition, reproductive efficiency, and disease incidences (Galligan and Groenendaal, 2001). In an analysis of an investment opportunity at the dairy level, cash flows are generally uncertain because of biological variability or incomplete knowledge of the system (Galligan and Groenendaal, 2001). The impact that a Precision Dairy Farming technology has on productive and economic performance is difficult to examine because of the changing nature of the decision environment where investments are often one-time investments but returns accrue over a longer period of time (van Asseldonk, 1999, van Asseldonk et al., 1999a, van Asseldonk et al., 1999b, Verstegen et al., 1995, Ward, 1990). Further, benefit streams resulting from investment in a Precision Dairy Farming technology are highly dependent upon the user’s ability to understand and utilize the information provided by the new technology (Bannister and Remenyi, 2000). An economic analysis of the value of Precision Dairy Farming technologies requires consideration of the effect of adoption on both quality and timeliness of decisions (Verstegen et al., 1995). Improvements associated with adoption of new Precision Dairy Farming technologies may increase profits directly through improved utilization of data provided by the technology or indirectly through recommendations of consultants utilizing the new information (Tomaszewski et al., 1997). It is difficult, if not impossible to quantify the economic value of personal welfare associated with a proposed change (e.g. free time or prestige) (Otte and Chilonda, 2000). For example, it is nearly impossible to quantify the satisfaction of having a healthy herd, reduction of animal suffering, reduced human health risks, and environmental improvements (Huirne et al., 2003). Despite efforts to formalize the rational decision making analysis of investment in information technologies, many business executives ultimately make their investment decision based on "gut feel" or "acts of faith" (Bannister and Remenyi, 2000, Passam et al., 2003, Silk, 1990). Ultimately, decision making is and should be dependent upon both rational analysis and instinct (Bannister and Remenyi, 2000).

Simulation of Dairy Farms

Mayer et al. (1998) proposed that with the variety of management issues a dairy manager faces in an ever-changing environment (e.g. environmental, financial, and biological), best management strategies cannot be verified and validated with field experiments. As a result, simulation is the only method of "integrating and estimating" these effects (Mayer et al., 1998). Simulations are mathematical models designed to represent a system, such as a dairy farm, for use in decision-making. Simulation models are useful and cost-effective in research that requires complex scenarios involving a large number of variables with large groups of animals over a long period of time under a large range of conditions (Bethard, 1997, Shalloo et al., 2004). The primary advantages of using mathematical computer simulation models in evaluating dairy production issues are the ability to control more variables within the model than with a field trial and the reduced costs associated with this kind of effort (Shalloo et al., 2004, Skidmore, 1990). These economic models can also be useful in evaluating alternatives where very little real data is available yet (Dijkhuizen et al., 1995). Simulating a system is particularly useful when uncertain, complex feedback loops exist (e.g. disease affects production which then impacts other variables further back in the system) (Dijkhuizen et al., 1995). Models that represent system uncertainty, while effectively using available information, provide more realistic insight than models that do not consider a range of responses (Bennett, 1992, Passam et al., 2003).

Simulation or other systemic methods are preferred to capture the complexity of a dairy system as they can evaluate multiple biological and economic factors affecting performance, including management, feeding, breeding, culling, and disease (Skidmore, 1990, Sorensen et al., 1992). Because the dairy system includes environmental, economic, and physical components, accounting for interactions among components and tracing the effects of an intervention through the entire system are essential (Cabrera et al., 2005). Simulation models are ideal for analyzing investment strategies because they can effectively examine improvement in biological parameters based on farm-specific data rather than simple industry averages (Delorenzo and Thomas, 1996, Dijkhuizen et al., 1995, Gabler et al., 2000, Jalvingh, 1992, van Asseldonk et al., 1999b). Simulation of a farm can be accomplished by conducting two simulations, one with and one without a proposed change or intervention and then comparing these simulations to examine the impact on biological or economic parameters of interest (van Asseldonk, 1999). The output of a series of simulations provides a range of results, more realistically depicting biological variability than simple models (Marsh et al., 1987).

Risk and uncertainty are major considerations within a dairy production system because of the random nature of milk production, biology, disease, weather, input costs, and milk prices (Delorenzo and Thomas, 1996). This risk and uncertainty represents a major portion of the difficulty and complexity of managing a dairy operation (Huirne, 1990). Uncertainty must be considered in decision-making to avoid biased estimates and erroneous decisions (Kristensen and Jorgensen, 1998). Future costs and returns are always uncertain (Lien, 2003). Within precision agriculture, accurate representation of risk associated with technology adoption is critical in the decision making process (Marra et al., 2003).

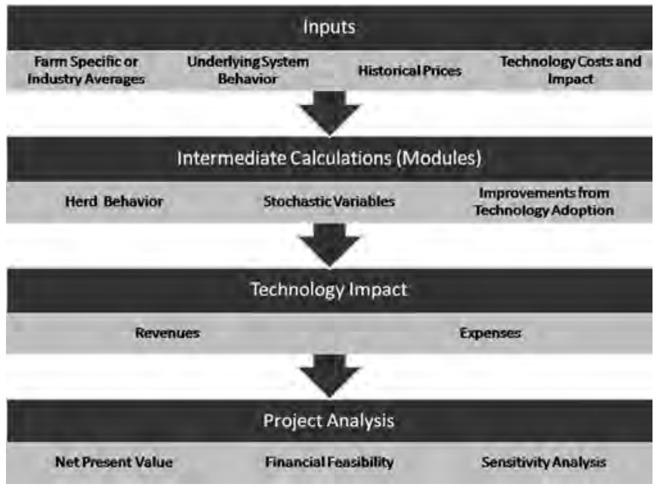
When managers do not have sufficient information to assess the risk outcomes of decisions, they use subjective probabilities based on past experiences and their own judgment (Huirne, 1990). In most situations, decision makers are primarily concerned with the chances of the realized returns from an investment being less than predicted (Galligan et al., 1987). The ability of a model to reflect real world conditions increases with consideration of more variables (Jalvingh, 1992). Nevertheless, to ensure that the model remains practical and reasonable, only variables with the most influence on the final desired outcome should be entered into the model as random (Jalvingh, 1992, Lien, 2003).

Purdue/Kentucky Research Model

Bewley et al. (2010b) developed a simulation model of a dairy farm to evaluate investments in precision dairy farming technologies by examining a series of random processes over a ten-year period. The model was designed to characterize the biological and economical complexities of a dairy system within a partial budgeting framework by examining the cost and benefit streams coinciding with investment in a Precision Dairy Farming technology. Although the model currently exists only in a research form, a secondary aim was to develop the model in a manner conducive to future utility as a flexible, farm-specific decision making tool. The basic model was constructed in Microsoft Excel 2007 (Microsoft, Seattle, WA). The @Risk 5.0 (Palisade Corporation, Ithaca, NY) add-in for Excel was utilized to account for the random nature of key variables in a Monte Carlo simulation. In Monte Carlo simulation, random drawings are extracted from distributions of multiple random variables over repeated iterations of a model to represent the impact of different combinations of these variables on financial or production metrics (Kristensen and Jorgensen, 1998).

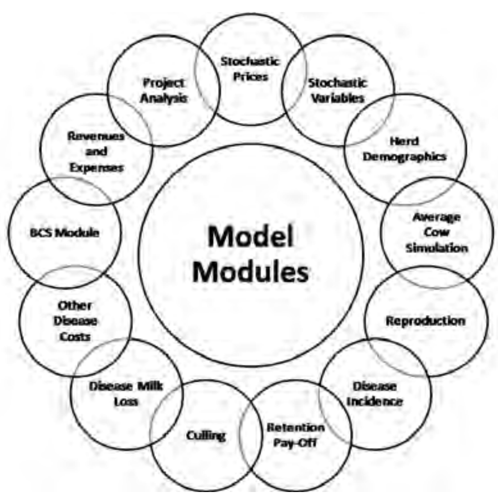
The basic structure of the model is depicted in Figure 1. The underlying behavior of the dairy system was represented using current knowledge of herd and cow management with relationships defined from existing literature. Historical prices for critical sources of revenues and expenses within the system were also incorporated as model inputs. The flexibility of this model lies in the ability to change inputs describing the initial herd characteristics and the potential impact of the technology. Individual users may change these inputs to match the conditions observed on a specific farm.

Figure 1. Diagram depicting general flow of information within the model



After inputs are entered into the model, an extensive series of intermediate calculations are computed within 13 modules, each existing as a separate worksheet within the main Excel spreadsheet. Each module tracks changes over a 10-year period for its respective variables. Within these inter-connected modules (Figure 2), the impact of inputs, random variables, and technology-induced improvements are estimated over time using the underlying system behavior within the model. Results of calculations within 1 module often affect calculations in other modules with multiple feed-forward and feed-backward interdependencies. Each of these modules eventually results in a calculation that will influence the cost and revenue flows necessary for the partial budget analysis. Finally, the costs and revenues are utilized for the project analysis examining the net present value (**NPV**) and financial feasibility of the project along with associated sensitivity analyses.

Figure 2. Diagram of model modules



Agricultural commodity markets are characterized by tremendous volatility and, in many countries, this volatility is increasing with reduced governmental price regulation. As a result, economic conditions and the profitability of investments can vary considerably depending on the prices paid for inputs and the prices received for outputs. Producers are often critical of economic analyses that fail to account for this volatility, by using a single value for critical prices, recognizing that the results of the analysis may be different with higher or lower milk prices, for example. In a simulation model, variability in prices can be accounted for by considering the random variation of these variables. In this model, historical U.S. prices from 1971 to 2006 for milk, replacement heifers, alfalfa, corn, and soybeans were collected from the "Understanding Dairy Markets" website (Gould, 2007). Historical cull cow prices were defined using the USDA-National Agricultural Statistics Service values for "beef cows and cull dairy cows sold for slaughter" (USDA-NASS, 2007). Base values for future prices (2007 to 2016) of milk, corn, soybeans, alfalfa, and cull cows were set using estimates from the Food and Agricultural Policy Research Institute's (**FAPRI**) U.S. and World Agricultural Outlook Report (FAPRI, 2007). Variation in prices was considered within the simulation based on historical variation. In this manner, the volatility in key prices can be considered within a profitability analysis.

Although there is probably no direct way to account for the many decisions that ultimately impact the actual profitability of an investment in a Precision Dairy Farming technology, this model includes a Best Management Practice Adherence Factor (**BMPAF**) to represent the potential for observing the maximum benefits from adopting a technology. The BMPAF is a crude scale from 1 to 100% designed to represent the level of the farm management. At a value of 100%, the assumption is that the farm management is capable and likely to utilize the technology to its full potential. Consequently, they would observe the maximum benefit from the technology. On the other end of the spectrum, a value of 0% represents a scenario where farm management installs a technology without changing management to integrate the newly available data in efforts to improve herd performance. In this case, the farm would not recognize any of the benefits of the technology. Perhaps most importantly, sensitivity analyses allow the end user to evaluate the decision with knowledge of the role they play in its success.

Investment Analysis of Automated Body Condition Scoring

To show how it can be used practically, this model was used for an investment analysis of automatic body condition scores on dairy farms (Bewley et al., 2010a). Automated body condition scoring (**BCS**) through extraction of information from digital images has been demonstrated to be feasible; and commercial technologies are being developed (Bewley et al., 2008). The primary objective of this research was to identify the factors that influence the potential profitability of investing in an automated BCS system. An expert opinion survey was conducted to provide estimates for potential improvements associated with technology adoption. Benefits of technology adoption were estimated through assessment of the impact of BCS on the incidence of ketosis, milk fever, and metritis, conception rate at first service, and energy efficiency. For this research example, industry averages for production and financial parameters, selected to represent conditions for a U.S. dairy farm milking 1000 cows in 2007 were used. Further details of model inputs and assumptions may be obtained from the author.

Net present value (**NPV**) was the metric used to assess the profitability of the investment. The default discount rate of 8% was adjusted to 10% because this technology has not been marketed commercially; thus, the risk for early adopters of the technology is higher. The discount rate partially accounts for this increased risk by requiring higher returns from the investment. The general rule of thumb is that a decision with a NPV greater than 0 is a "go" decision and a worthwhile investment for the business. The investment at the beginning of the project includes the purchase costs of the equipment needed to run the system in addition to purchasing any other setup costs or purchases required to start the system. Recognizing that a simpler model ignores the uncertainty inherent in a dairy system, Monte Carlo simulation was conducted using the @Risk add-in. This type of simulation provides infinite opportunities for sensitivity analyses. Simulations were run using 1000 iterations in each simulation. Simulations were run, using estimates provided by experts, for scenarios with little to no improvement in the distribution of BCS and with definite improvement.

Profitability Analysis

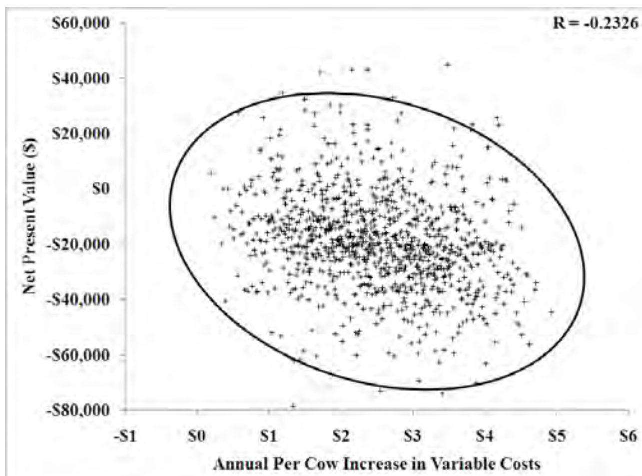
For the small likelihood of improvement simulation, 13.1% of simulation iterations resulted in a positive NPV whereas this same number was 87.8% for the scenario with a definite improvement. In other words, using the model assumptions for an average 1000 cow U.S. dairy in 2007, investing in an automated BCS system was the right decision 13.1% or 87.8% of the time depending on the assumption of what would happen with BCS distribution after technology adoption. The individual decision maker's level of risk aversion would then determine whether they should make the investment. Although this serves as an example of how this model could be used for an individual decision maker, this profitability analysis should not be taken literally. In reality, an individual dairy producer would need to look at this decision using herd-specific variables to assess the investment potential of the technology. The main take home message was that because results from the investment analysis were highly variable, this technology is certainly not a "one size fits all" technology that would prove beneficial for all dairy producers.

Sensitivity Analyses

The primary objective of this research was to gain a better understanding of the factors that would influence the profitability of investing in an automated BCS system through sensitivity analysis. Sensitivity analysis, designed to evaluate the range of potential responses, provides further insight into an investment analysis (van Asseldonk et al., 1999b). In sensitivity analyses, tornado diagrams visually portray the effect of either inputs or random variables on an output of interest. In a tornado diagram, the lengths of the bars are representative of the sensitivity of the output to each input. The tornado diagram is arranged with the most sensitive input at the top progressing toward the least sensitive input at the bottom. In this manner, it is easy to visualize and compare the relative importance of inputs to the final results of the model.

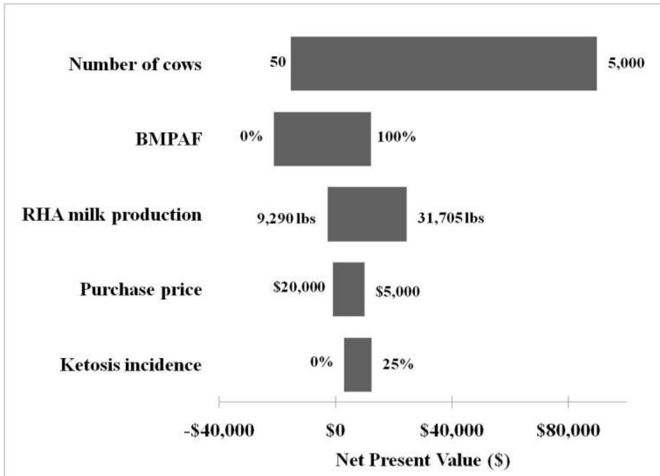
Improvements in reproductive performance had the largest influence on revenues followed by energy efficiency and then by disease reduction. Random variables that had the most influence on NPV were as follows: variable cost increases after technology adoption; the odds ratios for ketosis and milk fever incidence and conception rates at first service associated with varying BCS ranges; uncertainty of the impact of ketosis, milk fever, and metritis on days open, unrealized milk, veterinary costs, labor, and discarded milk; and the change in the percent of cows with BCS at calving ≤ 3.25 before and after technology adoption. Scatter plots of the most sensitive random variables plotted against NPV along with correlation coefficients demonstrate how random variables impact profitability. In both simulations, the random variable that had the strongest relationship with NPV was the variable cost increase. Not surprisingly, as the variable costs per cow increased the NPV decreased in both simulations (Figure 3). Thus, the value of an automated BCS system was highly dependent on the costs incurred to utilize the information provided by the system to alter nutritional management for improved BCS profiles.

Figure 3. Scatter plot of Net Present Value versus annual percentage increase in variable costs (for simulation using all expert opinions provided)



Finally, the results of any simulation model are highly dependent on the assumptions within the model. A one-way sensitivity analysis tornado diagram compares multiple variables on the same graph. Essentially, each input is varied (1 at a time) between feasible high and low values and the model is evaluated for the output at those levels holding all other inputs at their default levels. On the tornado diagram, for each input, the lower value is plotted at the left end of the bar and the higher value at the right end of the bar (Clemen, 1996). Simulations were run for high and low feasible values for 6 key inputs that may affect NPV. The tornado diagram for the 95th percentile NPV from the simulation with a small likelihood of improvement in BCS distribution is presented in Figure 4. Herd size had the most influence on NPV. The NPV was higher for the larger herd because the investment costs and benefits were spread among more cows.

Figure 4. Tornado diagrams for inputs affecting 95th percentile of Net Present Value for simulations using the estimates of all survey respondents[1]



[1] BMPAF is the Best Management Practice Adherence Factor, RHA milk production is rolling herd average milk production in lbs.

The next most important variable was the BMPAF. Again, this result was not surprising and reiterates that one of the most important determinants of project success was what the producer actually does to manage the information provided by the technology. There are many nutritional, health, reproductive and environmental decisions made by the dairy producer that have a major impact on changes in body reserves for both individual cows and groups of cows. Management level plays a critical role in determining returns from investing in a Precision Dairy Farming technology. The level of management in day-to-day handling of individual cows may also influence the impact of Precision Dairy Farming technologies. Van Asseldonk (1999) defined management capacity as “having the appropriate personal characteristics and skills to deal with the right problems and opportunities in the right moment and in the right way.” Effective use of an information system requires an investment in human capital in addition to investment in the technology (Streeter and Hornbaker, 1993). Then, the level of milk production was the next most sensitive input. As the level of milk production increased, the benefits of reducing disease incidence and calving intervals increased. As would be expected, the NPV increased with an increased base incidence of ketosis because the effects of BCS on ketosis would be exaggerated. The purchase price of the technology had a relatively small impact on the NPV as did the base culling rate.

Adoption Considerations

The list of Precision Dairy Farming technologies used for animal status monitoring and management continues to grow. Despite widespread availability, adoption of these technologies in the dairy industry has been relatively sparse thus far (Gelb et al., 2001, Huirne et al., 1997). Perceived economic returns from investing in a new technology are always a factor influencing technology adoption. Additional factors impacting technology adoption include degree of impact on resources used in the production process, level of management needed to implement the technology, risk associated with the technology, institutional constraints, producer goals and motivations, and having an interest in a specific technology (Dijkhuizen et al., 1997, van Asseldonk, 1999). Characteristics of the primary decision maker that influence technology adoption include age, level of formal education, learning style, goals, farm size, business complexity, increased tenancy, perceptions of risk, type of production, ownership of a non-farm business, innovativeness in production, average expenditure on information, and use of the technology by peers and other family members. Research regarding adoption of Precision Dairy Farming technologies is limited, particularly within North America.

To remedy this, a five-page survey was distributed to all licensed milk producers in Kentucky (N=1074) on July 1, 2008. Two weeks after the first mailing, a follow-up postcard was mailed to remind producers to return the survey. On August 1, 2008, the survey was resent to producers who had not returned the survey. A total of 236 surveys were returned; 7 were omitted due to incompletion leaving 229 for subsequent analyses (21%). The survey consisted of questions covering general farm descriptive demographics, extension programming, and decision making behavior. With regard to Precision Dairy Farming the following question was presented to survey participants: *"Adoption of automated monitoring technologies (examples: pedometers, electrical conductivity for mastitis detection) in the dairy industry has been slow thus far. Which of the following factors do you feel have impacted these modest adoption rates? (check ALL that apply)."* Data were entered into an online survey tool (KeySurvey, Braintree, MA). Statistical analyses were conducted using SAS® (Cary, NC). Surveys were categorized by herd size, production system, operator age, and production level. Least squares means among categories were calculated for quantitative variables using the GLM procedure of SAS®. Statistical differences were considered significant using a 0.05 significance level using Tukey's test for multiple comparisons. For qualitative variables, χ^2 analyses were conducted using the FREQ procedure of SAS®. Statistical differences were considered significant at a 0.05 significance level.

Among the 229 respondents, mean herd size was 83.0 ± 101.8 cows and mean producer age was 50.9 ± 12.9. Reasons for modest adoption rates of Precision Dairy Farming technologies and dairy systems software are presented in Table 1. The reasons selected by the highest percentage respondents were (1) not being familiar with technologies that are available (55%), (2) undesirable cost to benefit ratios (42%) and (3) too much information provided without knowing what to do with it (36%%). The high percentage of producers who indicated they were unfamiliar with available technologies indicates that marketing efforts may improve technology adoption. Actual or perceived economic benefits appear to influence adoption rates demonstrating the need for economic models to assess technology benefits and re-examination of retail product prices. As herd size increased, the percentage of producers selecting "poor technical support/training" and "compatibility issues" increased ($P < 0.05$), which may be reflective of past negative experiences. In developing technologies, manufacturers should work with end-users during development and after product adoption to alleviate these customer frustrations. Few significant differences were observed among age groups, though the youngest producers were more likely to select "better alternatives/easier to accomplish manually." Prior to technology development, market research should be conducted to ensure that new technologies address a real need. Utilizing this insight should help industry Precision Dairy Farming technology manufacturers and industry advisors develop strategies for improving technology adoption. Moreover, this information may help focus product development strategies for both existing and future technologies.

Table 1. Factors influencing slow adoption rates of Precision Dairy Farming Technologies

Factor	N	Percent
Not familiar with technologies that are available	101	55%
Undesirable cost to benefit ratio	77	42%
Too much information provided without knowing what to do with it	66	36%
Not enough time to spend on technology	56	31%
Lack of perceived economic value	55	30%
Too difficult or complex to use	53	29%
Poor technical support/training	52	28%
Better alternatives/easier to accomplish manually	43	23%
Failure in fitting with farmer patterns of work	40	22%
Fear of technology/computer illiteracy	39	21%
Not reliable or flexible enough	33	18%
Not useful/does not address a real need	27	15%
Immature technology/waiting for improvements	18	10%
Lack of standardization	17	9%
Poor integration with other farm systems/software	12	7%
Compatibility issues	12	7%

Conclusions and Outlook

Though Precision Dairy Farming is in its infancy, new Precision Dairy Farming technologies are introduced to the market each year. As new technologies are developed in other industries, engineers and animal scientists find applications within the dairy industry. More importantly, as these technologies are widely adopted in larger industries, such as the automobile or personal computing industries, the costs of the base technologies decrease making them more economically feasible for dairy farms. Because the bulk of research focused on Precision Dairy Farming technologies is conducted in research environments, care must be taken in trying to transfer these results directly to commercial settings. Field experiments or simulations may need to be conducted to alleviate this issue. Because of the gap between the impact of Precision Dairy Farming technologies in research versus commercial settings, additional effort needs to be directed toward implementation of management practices needed to fully utilize information provided by these technologies. To gain a better understanding of technology adoption shortcomings, additional research needs to be undertaken to examine the adoption process for not only successful adoption of technology but also technology adoption failures.

Before investing in a new technology, a formal investment analysis should be conducted to make sure that the technology is right for your farm's needs. Examining decisions with a simulation model accounts for more of the risk and uncertainty characteristic of the dairy system. Given this risk and uncertainty, a stochastic simulation investment analysis will represent that there is uncertainty in the profitability of some projects. Ultimately, the dairy manager's level of risk aversion will determine whether or not he or she invests in a technology using the results from this type of analysis. Perhaps the most interesting conclusion from our model case study was that the factors that had the most influence on the profitability investment in an automated BCS system were those related to what happens with the technology after it has been purchased as indicated by the increase in variable costs needed for management changes and the management capacity of the farm. Decision support tools, such as this one, that are designed to investigate dairy herd decisions at a systems level may help dairy producers make better decisions. Precision dairy farming technologies provide tremendous opportunities for improvements in individual animal management on dairy farms. In the future, Precision Dairy Farming technologies may change the way dairy herds are managed.

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After the passing of her parents in 2007, Leona along with her four younger sisters succeeded their mixed farming operation of 4,000 head and 7,000 acres; all the while continuing to pursue their education. As an Agri-Business graduate of Olds College AB, Leona has developed her leadership skills and gained knowledge, as well as connections, within the agricultural industry of Western Canada. In 2011, her application was successful in receiving one of three prestigious Canadian Nuffield Scholarships. This enabled her to study the topic of succession planning and farm diversification around the world. She traveled to countries such as India, Singapore, Australia, New Zealand and the United Kingdom. Her most recent trip to Africa gave her a hands-on experience which she treasures most. Today, Leona's role as a keynote speaker grows. She leads by setting an example and will share her experiences which exemplify how to take unimaginable change, adapt to it and succeed. Her heartfelt and very realistic perspective is sure to capture her audiences and offer a unique reflective experience. Be certain that this young 'change maker' will continue to influence all those who find themselves crossing paths with her!


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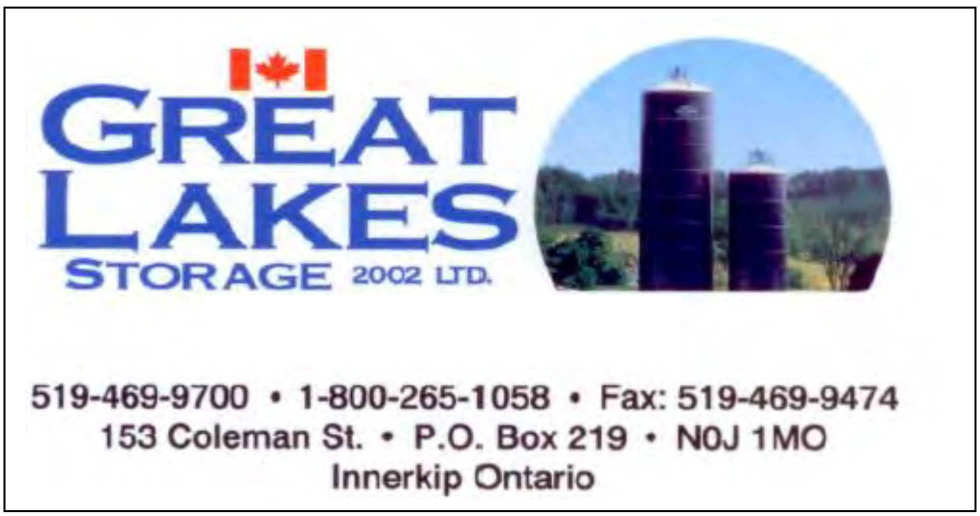
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CORN SILAGE FOR DAILY CATTLE

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INTRODUCTION

High quality corn silage contributes greatly to supplying the energy, starch and forage neutral detergent fiber needs of high-producing dairy cows, reducing purchased feed costs from expensive grain and byproduct supplements, and generating milk revenues for dairy producers throughout the world. The purpose of this paper is to review selected recent developments and considerations for corn silage (**WPCS**). Refer to Figure 1 for an overview of the factors that influence the nutritive value of corn silage.

CORN SILAGE HARVEST PRACTICES

<u>Meta-Analysis</u>

Ferraretto and Shaver (2012b) performed a meta-analysis to determine the impact of dry matter (**DM**) content, kernel processing (**PROC**) and theoretical length of cut (**TLOC**) of WPCS on intake, digestion and milk production by dairy cows. The dataset was comprised of 106 treatment means from 24 peer-reviewed journal articles from 2000 to 2011. Categories for DM content at silo removal and PROC and TLOC at harvest were: ≤ 28% (**VLDM**), >28% to 32% (**LDM**), >32% to 36% (**MDM**), >36% to 40% (**HDM**), and >40% (**VHDM**) DM; 1 to 3 or 4 to 8 mm roll clearance or unprocessed; 0.48 to 0.64, 0.93 to 1.11, 1.27 to 1.59, 1.90 to 1.95, 2.54 to 2.86, and ≥ 3.20 cm TLOC. Data were analyzed using Proc Mixed in SAS with WPCS treatments as Fixed effects and trial as a Random effect.

Milk yield was decreased by 2 kg/d per cow for VHDM. Fat-corrected milk (**FCM**) yield decreased as DM content increased. Total-tract digestibility of dietary starch (**TTSD**) was reduced for VHDM compared to HDM and LDM. Processing (1 to 3 mm) increased TTSD compared to 4 to 8 mm PROC and unprocessed WPCS. Milk yield tended to be 1.8 kg/cow/d greater, on average, for PROC (1 to 3 mm) and unprocessed WPCS than 4 to 8 mm PROC. The TLOC of WPCS had minimal impact on any of the parameters evaluated. Starch digestibility and lactation performance were reduced for dairy cows fed diets containing WPCS with >40% DM or WPCS with insufficient kernel processing.

An interaction was observed between DM content and kernel processing for TTSD. Kernel processing increased TTSD for diets containing WPCS with 32% to 40% DM. Also, an interaction was observed between TLOC and kernel processing for TTSD. Kernel processing increased diet TTSD when TLOC was 0.93 to 2.86 cm. Kernel processing WPCS to improve starch digestibility was effective across a wide range of DM contents and TLOC, but did not overcome adverse effects of very high DM content on TTSD and was ineffective at very long TLOC.

Kernel Processing

About half of the energy value in WPCS comes from its starch content which is provided by the grain fraction. Total tract digestibility of this starch can range from about 80% to nearly 100% in lactating dairy cows. The major crop factors associated with this variation in starch digestibility are kernel particle size as affected by the process of chopping and kernel processing, length of time that the WPCS remains in the silo prior to feeding, and kernel maturity, moisture content or hardness at the time of harvest.

A kernel processing score was developed at the U.S. Dairy Forage Research Center (Madison, WI; Ferreira and Mertens, 2005) which involves sending a WPCS sample to a commercial feed testing laboratory where it is dried, sieved through a series of wire mesh sieves of varying size, starch analyses performed, and the proportion of the starch in the sample that is retained or has passed through a 4.75 millimeter sieve is determined. The finer starch or the starch that passes through this sieve is more highly digestible in the cow. The researchers provided the following guidelines:

% of Starch in Corn Silage passing through the 4.75 mm Sieve	Kernel Processing Score (**KPS**)
Greater than 70%	Excellent
50% to 70%	Adequate
Less than 50%	Poor

To evaluate how well we are doing as an industry with the kernel processing of WPCS we have compiled data from both field research trials and commercial testing laboratory surveys. These results are presented in the following table.

	MN Field Trial 1	MN Field Trial 2	WI Field Trial 1	Lab Survey	WI Field Trial 2	Lab Survey	
Testing Lab	Dairyland				Rock River		Cumberland Valley
Year	2005 - 2007			2011	2011 - 2012	2010 - 2012	2010 - 2011
No. of samples	252	55	29	258	64	311	1,131
<u>KPS</u>	- - - - - - - - - - - -% of Sample by Processing Score- - - - - - - - - - - - - -						
Excellent	10%	8%	10%	17%	17%	16%	7%
Adequate	48%	76%	55%	68%	61%	62%	51%
Poor	42%	16%	35%	15%	22%	22%	42%

Collectively these independent datasets show that kernel processing can be improved as a low proportion of samples fall into the excellent processing score classification. A controlled digestibility trial with lactating dairy cows showed a six percentage unit increase in total tract starch digestibility as the kernel processing score increased from adequate to excellent (Ferreira, 2002). Our calculations indicate that this difference in starch digestibility could be worth 1 kg/d of milk per cow or a 1 kg/d per cow reduction in the feeding rate of shelled corn, both of which have significant economic consequences with today's milk and corn prices.

Check the kernel processing score of WPCS to see what steps can be taken to improve it during the next harvest season. Focus on forage harvester TLOC, roll gap settings, and roll maintenance. Long TLOC, especially if combined with a wide roll gap setting, will reduce the kernel processing score. Past research with processed WPCS indicated that 19 mm TLOC and 1 millimeter roll gap settings were best after considering silage packing and fermentation, kernel processing, digestibility, and lactation performance by dairy cows.

Due to the feeding of high WPCS rations and high prices for hay and straw as sources of physically-effective fiber in rations, there has been quite a bit of interest in increasing TLOC beyond 19 mm when harvesting WPCS. This, however, can create some real challenges with regard to proper kernel processing with conventional-type rolls.

Shredlage™

Ferraretto and Shaver (2012a) reported on an experiment to determine the effect of feeding Corn Shredlage™ (**SHRD**) versus conventional-processed WPCS (**KPCS**) on lactation performance by dairy cows. The KPCS was harvested using conventional rolls (3-mm gap) and set at a 19-mm TLOC. The SHRD was harvested using novel cross-grooved rolls (2.5-mm gap) and set at a 30-mm TLOC.

One hundred and twelve cows stratified by DIM, milk yield, breed and parity were randomly assigned to 14 pens with 8 cows. Pens were randomly assigned to the two TMR treatments in a completely-randomized design. A 2-wk covariate period with cows fed a 50:50 mixture of treatment diets was followed by an 8-wk treatment period with cows fed their assigned treatment diet. The TMR contained (DM basis) KPCS or SHRD (50%), alfalfa silage (10%), concentrate mixture (40%). Data were analyzed using Proc Mixed in SAS with covariate, treatment, week, and treatment x week interaction as Fixed effects and pen within treatment as a Random effect. Pen was the experimental unit.

Cows fed SHRD tended to consume 0.7 kg/d more DM. Milk yield and composition was similar between treatments. Yield of 3.5% FCM tended to be 1 kg/day greater for cows fed SHRD. A treatment by week interaction was detected for 3.5% FCM yield; similar during wk 2, a tendency for SHRD to be greater during wk 4 and 6, and greater by 2 kg/day for SHRD at wk 8. Ruminal in situ digestibility of starch, but not NDF, was greater for SHRD than KPCS. Total tract digestibility of dietary starch and NDF were greater for SHRD than KPCS.

More research is needed regarding fiber digestibility in corn shredlage and the relative physically-effective fiber in corn shredlage compared to hay-crop silage, whole cottonseed, and chopped hay or straw, to allow for better decisions on how best to utilize corn shredlage in dairy cattle diets. Harvest of corn shredlage may improve starch digestibility more when silage is harvested drier than normal and for hybrids with harder kernel texture, but research is needed. Also, controlled data on packing densities in bunker silos for corn shredlage is lacking.

High-Cut

Corn silage DM yield is reduced as the row-crop head is raised from 15 to 45 cm. The estimated milk per ton increases because the greater NDF and lignin portion of the whole-plant material is left in the field resulting in WPCS that contains more starch and with greater in vitro NDF digestibility (Neylon and Kung, 2003).

Actual milk yield was increased by 1.5 kg/d per cow for cows fed high-cut WPCS with no difference in DMI between the low-cut and high-cut treatments; feed efficiency (kg milk/kg DMI) was 3% greater for high-cut than low-cut. Both in vitro NDF digestibility and milk yield were, however, greater for cows fed low-cut BMR hybrid WPCS compared to cows fed high-cut conventional hybrid WPCS (Kung et al., 2008).

Varying WPCS height of cutting is a harvest management option since estimated milk per acre is reduced by only 1% to 3% for high-cut WPCS. Farm priorities for maximum yield versus higher quality can be used to determine height of cutting guidelines for individual farms, which may vary from year to year depending upon the yield and quality of the crop and existing on-farm inventories. On farms with erodible land, more beneficial crop residue can be left in the field with the high-cut harvest without sacrificing much milk per acre. Also, because nitrates tend to concentrate in the bottom portion of the stalk raising the crop-head head helps minimize nitrate concerns in drought years.

<u>Silage Fermentation</u>

Hoffman et al. (2011) reported that ensiling high-moisture corn (**HMC**) for 240 d reduced zein protein subunits that cross-link starch granules, and suggested that the starch-protein matrix was degraded by proteolytic activity over an extended ensiling period. This could explain reports of greater ruminal in situ starch degradability for HMC with greater moisture contents and extents of silage fermentation (Benton et al., 2005).

The Larson and Hoffman (2008) turbidity assay did not detect a reduction in zein protein over the ensiling period for HMC as was measured by high-performance liquid chromatography (Hoffman et al., 2011). Ammonia-N content increased, however, as HPLC zein protein subunits in HMC decreased (Hoffman et al., 2011), and ammonia-N was used in combination with mean particle size for modeling the effects of corn maturity, moisture content and extent of silage fermentation on ruminal and total-tract starch digestibilities for HMC at feed out (Hoffman et al., 2012a; Ferraretto et al., 2013). Based on the work by Hoffman et al. (2012a), a revised corn grain evaluation system (v2.0) has been developed (Hoffman et al., 2012b).

Newbold et al. (2006) reported that ruminal in situ starch and CP degradabilities increased for WPCS as length of storage time increased. Increased WPCS in vitro starch digestibility with greater length of storage time was reported by Hallada et al. (2008) and Der Bedrosian et al. (2012). Young et al. (2012) reported that the addition of protease enzymes and greater length of the storage time increased ammonia-N content and ruminal in vitro starch digestibility of WPCS.

The DairyOne (Ithaca, NY) on-line data base (http://www.dairyone.com/) reveals that for over 12,000 WPCS samples analyzed from May-2000 through April-2011, ammonia nitrogen averaged 7.1% of total nitrogen with a normal range from 3.0 to 11.1%. In our analysis of a dataset provided by Dairyland Labs (Arcadia, WI) with over 1,900 WPCS samples, ammonia nitrogen averaged 5.7% of total nitrogen with a normal range from 2.7 to 10.7%. Additionally, in our analysis of a dataset provided by Cumberland Valley Analytical Services (Maugansville, MD) with about 44,000 WPCS samples from May-2007 through February-2012, ammonia nitrogen averaged 9.6% of total nitrogen with a normal range from 7.8 to 11.4%. Corn silage DM content explained almost none of the ammonia nitrogen variation in either dataset, which may not be too surprising since length of silage fermentation prior to on-farm sampling was unknown and could have ranged from less than a few weeks to over a year in storage.

We are currently conducting research to determine the effectiveness of ammonia-N or soluble-CP concentrations for predicting WPCS starch digestibility using vacuum-sealed mini-silo bags with hybrid type, moisture content, particle size, additives, and fermentation length as treatments.

CORN SILAGE HYBRID TYPE

Ferraretto and Shaver (2013) performed a meta-analysis to evaluate the effects of WPCS hybrid type on digestion, rumen fermentation and lactation performance by dairy cows using a dataset of 145 treatment means from 52 peer-reviewed articles published 1990-2013.

Categories for hybrids differing in grain and stalk characteristics, respectively, were: conventional dent (**CONG**), nutridense (**ND**), high oil (**OIL**), and waxy (**WAXY**); conventional, dual-purpose, isogenic or low-normal fiber digestibility (**CONS**), brown midrib (**BMR**), high fiber digestibility (**HFD**), and leafy (**LFY**). Genetically-modified (**GM**) hybrids were compared with their genetically similar non-biotech counterpart (**ISO**). Data were analyzed using Proc Mixed in SAS with hybrid as fixed and trial as random effects.

Silage nutrient composition was similar, except for lower CP and ether extract for CONG than ND and OIL. Milk fat content and yield and protein content were lowest for OIL. Intake, milk production and total tract nutrient digestibilities were unaffected by grain hybrid type. Except for lower lignin for BMR, and a trend for lower starch for HFD than CONS, silage nutrient composition was similar among hybrids of different stalk type.

Dry matter intake, milk yield, and protein yield were 1.0, 1.2, and 0.05 kg/d per cow, respectively, greater for BMR than CONS and LFY on average. Total tract NDF digestibility was greater and starch digestibility reduced for BMR and HFD compared to CON or LFY. No differences in lactation performance were observed for GM compared to ISO. Research does not suggest any cause for concern about feeding WPCS produced from genetically-modified seed corn when the traits make agronomic and economic sense to the grower.

Except for negative effects of OIL on milk fat and protein percentages, differences were minimal among WPCS hybrids differing in grain type. Except for positive effects of BMR on DMI and milk and protein yields, differences were minimal among WPCS hybrids differing in stalk type. However, reduced ruminal and total tract starch digestibilities for BMR merit further study.

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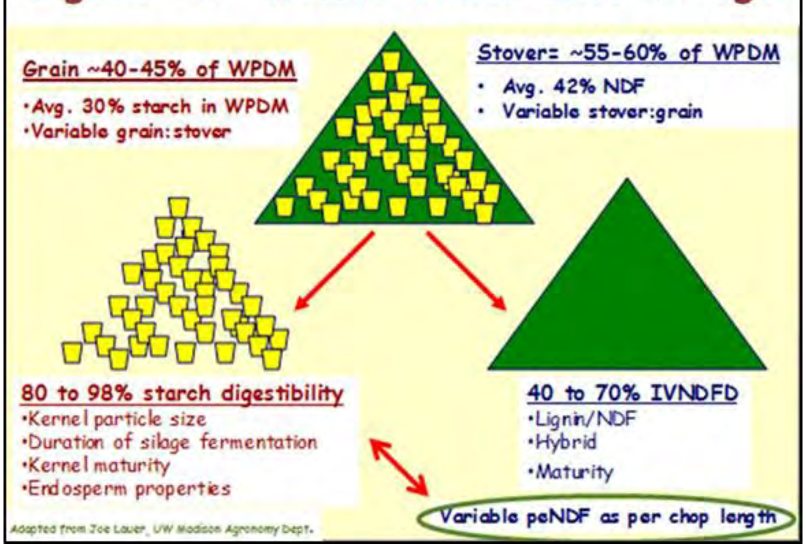
Figure 1: Whole-Plant Corn Silage



SUSTAINABLE FOOD AND DAIRY COW WELFARE
HOW DOES IT ALL FIT TOGETHER?

Crystal Mackay, Executive Director
Farm & Food Care Ontario

Today Canadians are more interested in the story behind their food than ever before. Yet with farmers representing less than 2% of the population, most Canadians don't know the people who milk the cows or understand the often many complicated processes it takes to "magically" make that cheese happen. Building trust and confidence and proactively answering the public's questions about food and farming is Farm & Food Care's mandate on behalf of its thousands of farmers and agri-food business members.

One of the biggest challenges with having a conversation with the average Canadian about farming is their perceptions or questions are often based on issues, what's been in the media or what they've "heard" somewhere. What makes the news or a documentary? What is most often seen online? It's often negative, inflammatory, special interest group driven or a grain of truth all stretched to the limit often well beyond the realities of Canadian farming.

The first step in the process to build public trust starts with doing the right thing. This is what farmers and associated businesses strive for every day, from doing chores in the morning to creating programs to help measure and manage practices and investing in research to continually do better. To see Farm & Food Care's welfare related resources, visit www.Livestockwelfare.com which houses videos and practical fact sheets and links to a searchable animal welfare research database.

Unfortunately, farm animal welfare is the topic most commonly used with extreme visuals, emotionally laden words, outright myths or at the very least unfair depictions of farm animal treatment. The first goal is transparency – how are real farm animals actually treated on real farms? Showing Canadians that dairy farmers, together with the help of veterinarians and animal welfare experts, are the people who truly care for farm animals is a large part of building and maintaining public trust.

Farm & Food Care's investment in 'open the barn door' transparency include hosting farm tours for media and chefs and creating resources like the Real Dirt on Farming booklet and www.virtualfarmtours.ca . The award winning Breakfast on the Farm event this summer was the best example of this when 2000 people visited a modern dairy farm for breakfast and a visit with over 130 volunteers to talk about where their food comes from. The goal is to give Canadians a look into real farms and introduce them to the people who make their food so they can make informed food buying decisions - and know who to turn to the next time they see something negative or questionable online or on television.

Farmers and people who work in the agri-food industry do not make decisions or look at issues like animal welfare in isolation. It's an important part of the overall goal in good farm management and providing healthy, affordable food for our country while caring for animals and the environment. How do we change the conversation about animal welfare to be more positive and in balance with the other principles? See some great blogs on the topic at www.letstalkfarmanimals.ca

Farm & Food Care has tested some of principles of sustainable food through focus groups and quantitative surveys with Ipsos to see how effective it is to have a more holistic discussion about farming and food production. In a 2012 survey of 1,200 non-farming Canadians, respondents were asked to rank the five principles in order of importance to them. Food safety and human health were ranked as the most important followed by food affordability, then environment and animal welfare.

When having a discussion or considering making changes to any food production or farm practices, all five principles need to be given fair and practical consideration. For example, if a farmer was asked to convert a tie stall barn to a parlour system with an exercise yard, all five principles should come into play. Starting with the health and safety of the people who work in the barn; the safety and quality of the milk; the health and welfare of the cows; the environmental footprint of the new barn; the economic viability of the farm and supply chain and of course the cost of the dairy products to the average consumer.

Anti-agriculture activists specialize in one subject or position such as “anti-confinement” or “ban everything” tactics that focus on only one sector or principle such as welfare in the spectrum – divide and conquer. Industry experts are specialists within each category, often to the microscopic level. It’s not normal practice for the animal welfare specialist to consult with the food affordability or food safety experts when making recommends on what’s best for cows. Individual companies make announcements or use one of the principles in the spectrum as a short-term marketing advantage, as demonstrated recently by A&W with their hormone and antibiotic claims. Unfortunately several laws, policies or marketing strategies related to food production can be shown to have many unintended consequences when a decision is made in isolation.

This needs to change to truly embrace sustainable food and farming in Canada. It is important to emphasize that the five principles are all linked together and changing one can have either a positive or negative influence on the other four. The reality on the farm is that it’s all about balance, and pros and cons of each decision, while trying to work with Mother Nature and animals. Everyone who makes a living from farming and the agri-food sector can play a part and get involved with having a conversation with Canadians about food and farming in this country.

To learn more about sustainable farming, Farm & Food Care and how to have a better conversation with Canadians about tough topics like pesticides and antibiotics, come to the Farm & Food Care Conference and **Annual Meeting on April 15-16th in Milton**. Details are available at www.farmfoodcare.org or contact the office at 519-837-1326. Farm & Food Care is the first coalition of its kind representing thousands of farmers and associated businesses with a mandate to build public trust in food and farming. Individuals, organizations and companies who support that objective can become a member of Farm & Food Care or support this work by sponsoring a project or making a charitable donation to the Farm & Food Care Foundation at www.farmcarefoundation.ca.

FOOD FROM OUR FARMS . . . . .
AND FOOD FOR THOUGHT ABOUT MARKETING

2014 is the tenth anniversary of “learning from lunch”, and there are still new stories to tell and new things to learn about marketing dairy products. The products so graciously provided by your industry partners in the processing sector offer us not just “food” but also “food for thought”. It is our hope that these products and the information presented about them will increase awareness and stimulate new interest among producers in the marketing side of the industry. We salute these products as opportunities to expand markets, add value and strengthen the industry.

If there is one segment of the market that has exploded with new varieties and changing tastes in the last ten years, it is definitely cheese. As Canadian eating habits became more "cultured", artisan cheese making was going to happen but formal programs like DDPIP and the Artisan Dairy Program have made a big difference. To celebrate ten years of showing off new cheese products, four of our local cheese makers have donated cheese this year. **Bright Cheese and Butter Company,** established in 1874, have provided fresh curds, a rural Canadian tradition that can be a great product to connect consumers back to rural Ontario. **Local Dairy** in Ingersoll have provided Paneer, Duro Blando and Queso Fresco cheeses, demonstrating that ethnic, as in Indian and Latin American is here to stay. A third Oxford County processor, **Gunn's Hill Cheese** knows the meaning of artisan very well. They have provided Beau's Abbey Style beer washed cheese, and their national award winning "5 Brothers", a unique and flavourful mix between the recipes for Appezeller and Gouda cheeses. In neighbouring Waterloo County **Mountainoak Cheese,** the newest artisan cheese maker in the area, is also gaining national recognition for their product line. Their Mountainoak Farmstead Premium Gold, a 1-year aged gouda style cheese, was selected as the best firm specialty cheese at the British Empire Cheese Show. Further from home but cooperatively owned by local members of EastGen, Thornloe Cheese is here with no less than six traditional cheeses with a twist. Yes they donated old standbys like Mild and Old Cheddar, Colby and Marble but also versions of these traditional cheeses with peppers and other vegetables. Most of these companies make gift baskets of all local cheeses, so remember them when you need a "dairy themed" gift for friends, farm staff or clients.

John Miller milks 120 Jerseys in Creemore and sells his milk in glass bottles to reduce his carbon footprint while providing quality milk to customers that want to know where it comes from. You can buy Miller's milk at the farm and in numerous locally owned grocery and specialty stores in central Ontario. You can connect with them on facebook, twitter and instagram, and the store sells cow T-shirts too!

These "local" processors are adding a new dimension to our dairy industry and reconnecting the consuming public with the dairy farm in a way that will help us move towards greater sustainability. Our supply management system depends on the support of government and ultimately on the support of the public and consumers. Local processors and especially on farm processors can help us form bonds with consumers that will foster trust and empathy, and build relationships and markets for Ontario dairy products.

The blue cow logo and ice cream continue to be a marketing story worthy of some attention. With your support, special pricing, the blue cow and a concerted marketing effort, all Canadian ice cream is holding its own in the continuing competition with frozen desserts. Kawartha Dairy who has donated a variety of great ice cream flavours this year has never doubted the value of Canadian ingredients. Their ice cream line has been all Canadian for more than 75 years.

Yogurt is a growth sector that appeals to taste, convenience and health. Since 1971, Canadian yogurt consumption has increased from 471 g to 8.7 kg per person per year. From drinkable yogurts and tubes to probiotics and unique flavors, nutritious innovative products from Ultima Foods have played a vital role in this tremendous growth. Ultima, which previously marketed the international Yoplait brand, has undergone an ambitious rebranding in the last two years. Since launching their **IÖGO** brand in August 2012, they have quickly become a market leader. Among yogurt "styles" Greek yogurt is the talk of the town, and their catchy dancing cow ads are making sure **IÖGO Greko** earns high recognition ratings and scores big in sales as well.

Another market segment experiencing growth, which also adds value at the farm level is organic dairy products. **Organic Meadow**, provider of organically produced coffee cream for our meeting today, is a Co-op with over 60 producer members, and they are actively seeking new Organic Dairy Producers to fill the growing demand for milk produced by family owned and operated organic dairy farms.

With all the product development we have seen in the last decade, one would think there is nothing left to invent. But **Gay Lea** has a definite winner in their new **Cinnamon & Brown Sugar Spreadables.** This irresistible butter based spread demonstrates that innovation is alive and well at this coop dairy, owned by Ontario dairy producers.

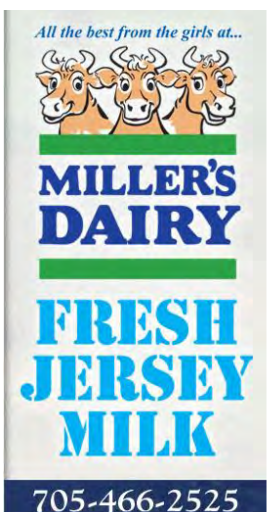
Marketing is everyone’s business . . . . . and we hope that we have stimulated your appetite, both for these innovative dairy products themselves and for the cooperative marketing approaches that our industry needs to expand the marketplace. We also hope that after the meeting you will make a point of buying and enjoying the products served today at your own kitchen tables, in the interest of a bigger and stronger Canadian dairy industry.

Jack Rodenburg, on behalf of the Planning Committee.

100% CANADIAN MILK™

Thank you to all of our food sponsors and to all innovators in the dairy sector that are growing markets and building relationships.

As a 100% Canadian, 100% family owned company we salute Kawartha Dairy for their 100% commitment to Canadian dairy. For over 75 years this company has used exclusively Canadian milk and cream in its ice cream products. Founded in 1937 by Jack and Ila Crowe the company began as a fluid processor delivering door to door to the homes and cottages in the Bobcaygeon area. Jack learned ice cream making in the 50's and the great taste and quality quickly became the talk of cottage country. Today Kawartha Dairy operates 8 retail stores and services a wide range of wholesale customers, from retail outlets to foodservice establishments and of course, ice cream parlours. The company also provides custom production services to other food companies.
Once an eastern Ontario processor, Kawartha ice cream is now available by the scoop regionally at Chocolate Sensations in Paris, I Love Chocolate in Fergus, Mr. Sub in Guelph, Chill Ice Cream and Purdy’s in London, Best's Home Made Ice Cream in Grand Bend, Mickey’s in Elora and Picard's in Woodstock.
Kawartha packaged ice cream is sold in this area by Aylmer Valumart, Ayr Foodland, Picard's Truly Scrumptious in Brantford, The Horn of Plenty, Metro and Greensville Gourmet in Dundas, Elmira Foodland, Darr’s in Elora, Marc's Valumart in Erin, Gallagher's in Fenwick, Knapp's, Bella Roma, and Market Fresh in Guelph, J & J, and Royal In Hamilton, Forwell's in Heidelberg, Trembletts in Ingersoll, Central Fresh in Kitchener, Unger's and Sunripe in London, Dutch Mill in Waterdown, Walkom's Valumart in Mitchell, Commisso's in Niagara Falls, Harvest Barn Niagara on the Lake, Rockwood Foodland, Shakespeare Pies, McDonald's Grocery in St. Mary's, Harvest Barn St. Catharines, The Punch Bowl, Lakeview and Elm Grocery in Stoney Creek, Vincenzo's in Waterloo, Wellesley Service Center, T-Bear's in Windsor and Dean's Valumart in Wingham.



7280 Simcoe Rd #9, Creemore, Ontario.

John Miller milks 120 Jersey cows under the prefix Jalon Jerseys on a 700 acre farm just outside Creemore, Ontario. His mother's family has a long history in milk processing and retail as Bisset Dairies in Goderich, where his great grandfather was the first in Ontario to sell bottled milk back in 1896. Miller's Dairy started in 2012 to meet the growing demand for "local". They process their Jersey milk on-farm into skim, 1%, 2%, chocolate and whole milk, as well as 10% and 35% cream, all sold in 1 and 2 quart glass bottles. It is sold at the farm as well is in over 50 retail outlets from Owen sound to Orillia and as far south as Oakville.
Check their website at www.millersdairy.com or connect with them on facebook, twitter or instagram.

We thank John for providing Miller's fresh Jersey milk at wholesale price and thank Scotiabank for covering the cost.

Mountainoak Cheese Ltd
3165 Huron Road, New Hamburg, Ontario, N3A 3C3
Telephone: 519.662.4967
Email: adam@mountainoakcheese.ca

On-farm Store Hours, Fri. and Sat. 10 a.m. to 6 p.m.

Mountainoak Cheese is the culmination of a lifelong dream for proprietors, Adam and Hannie van Bergeijk, and for their customers, it may be the beginning of a love affair with superb-quality artisan Farmstead Gouda cheeses. The van Bergeijks have more than 30 years experience as cheese makers and are both graduates of the renowned cheese maker's school in Gouda, Holland, a centre of cheese making expertise for over three hundred years. In Holland, they operated a small on-farm cheese plant and their prize winning cheeses were popular with local consumers. But with two sons and a daughter interested in farming, Adam and Hannie emigrated to Canada in 1996, purchased the farm, and focused on dairy farming. Back then, on-farm artisan cheese making was not an option in Ontario, but the dream to do so was always there. Mountainoak Cheese opened its state of the art processing plant in September 2012. Using their traditional Dutch recipes, they make supurb quality farmstead cheese, and offer very interesting variations on spiced Gouda, using traditional cumin as well as black pepper, mustard seed, nettles and even gourmet black truffles. The state of the art cheese plant is unique because it uses fresh uncooled milk straight from the cows, for maximum freshness. And with no cooling and no transport, Mountainoak Cheese has the smallest possible environmental footprint.

Bright Store - 1 mile north of Bright on County Road 22.
Telephone 519-454-8600
Open weekdays 9-5 and Sat. 9-4

Shakespeare Store - 200 Huron Road, Shakespeare,
Telephone 519-625-1259
Open weekdays 9-5, Sat. 9-4 and Sun. 11-4
Email: sales@brightcheeseandbutter.ca

The Original / L'original

Bright Brand

SINCE / DEPUIS 1874

At Bright Cheese and Butter we believe strongly in 100% natural cheese produced the way our founding fathers made it. We use all natural products in the processing of our cheese and even age our cheddar three years! We have monthly specials posted on our website as well as ongoing news about new products and recipes. Our products include Cheddar, cheese curds, flavoured curds, feta, mozzarella, gouda, havarti, parmesan, asiago, monterey jack, colby, marble and brick. Our flavoured cheeses include onion/parsley, hot pepper, dill & garlic, garlic and sizzlin' hot! . . . . Come in and try our tasters today!

Gunn's Hill Artisan Cheese is a small artisan cheese plant nestled within the rolling hills of Gunn's Hill Road in Oxford County. This small scale artisan cheese plant is the result of years of dreaming and planning by owner, operator and cheese maker Shep Ysselstein. The cheeses produced at Gunn's Hill Artisan Cheese are truly unique, although you can taste the Swiss influence from techniques and recipes Shep learned while making cheese in the Swiss Alps.

The cheese plant is located within the heart of the Dairy Capital of Canada and is only minutes away from downtown Woodstock. The milk used to create the cheeses comes from the neighbouring family dairy farm, Friesvale Farms, where the finest Canadian milk is produced. To ensure cheeses that are of top quality and taste, Gunn's Hill Artisan Cheeses are hand crafted using traditional cheese-making methods.

Visitors are welcome to visit Gunn's Hill Artisan Cheese at 445172 Gunn's Hill Road, Woodstock to experience the unique area, learn about dairy farming and local agriculture, take a tour, be a cheese maker for a day, and most importantly, simply enjoy wonderfully delicious cheeses. For more information, visit our website at www.gunnshillcheese.ca

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139 Victoria Street, Ingersoll, Ontario

For over 20 years, our customers have trusted us to provide them with the freshest, purest all-natural dairy products. Our milk is delivered daily from local farms in and around Oxford County, Canada's Dairy Capital, and is processed on-site by our family and staff members into the finest, freshest dairy products available.

We separate, process and pasteurize milk and cream daily on-site to produce the highest quality cheeses, yogurt, creams, and butters, free from colours, additives or preservatives. Our Perth County all natural yogurt has been available to customers throughout Ontario since 1960, and remains the same as it has always been: pure and nutritious. Our authentic line of Asli Indian dairy products are true to traditional family recipes handed down from one generation to the next, while our La Vaquita brand of creams and cheeses are inspired by traditional Latin American flavours. Local Dairy's diverse lines of all natural products are sure to please every palette and serve any occasion.

From our family to yours, we hope you continue to enjoy the finest and freshest products that Local Dairy has to offer.

Pride of the North

From fresh milk and a tradition of craftsmanship comes a taste of Northern Heritage A subsidiary of farmer-owned EastGen

Thornloe Cheese has produced a respected brand of cheese products in Northern Ontario for over 67 years! Our secret to success, old-fashioned cheese making techniques and fresh milk produced in this unique agricultural area.

Thornloe is pleased to offer mouth-watering curds available in a variety of flavours. Thornloe's Heritage Cheddar Cheese is available in a wide selection of ages and tempting seasonings. We also have a variety of specialty cheeses and a growing line of new products. Try some Thornloe Cheese today and enjoy the great taste that comes from tradition, quality and freshness.

Come visit us at the Cheese Factory and Store or visit the many retailers who carry Thornloe Cheese in Northern Ontario.

Thornloe Cheese Factory and Store 999697 Highway 11 N., Thornloe, ON P0J 1S0
Phone: 705-647-7441 Fax: 705-647-7107 www.thornloecheese.ca

Gay Lea Foods is excited to announce our latest innovation to the Spreadables line - Cinnamon & Brown Sugar Spreadables Butter! This new product is a perfect blend of Cinnamon, Brown Sugar and real Gay Lea butter that spreads right out of the fridge.

New Cinnamon & Brown Sugar Spreadables is perfect on waffles, French toast, and bagels…but it's not just a breakfast spread! Add flavour to your savoury sweet potatoes, carrots, and chicken or use it to flavour up your favorite baking treats including cinnamon buns, cookies and apple pie filling.

Iögo is a new brand of yogurt and fresh dairy products that is 100% Canadian. Created, developed and marketed across Canada by Ultima Foods, the innovation behind the brand was guided by the single goal of providing a natural taste. The brand has seven different product lines: iögo, iögo 0% (fat-free yogurt with 35 calories per 100-g serving), iögo Probio (new twists on probiotic yogurt, such as lactose-free flavours), iögo Greko (Greek yogurt), iögo Nomad (drinkable yogurt), iögo Zip (tube yogurt) and iögo Nano (fresh cheese and drinkable yogurt for children). All iögo products are gelatine-free with no artificial flavours or colours. They are also preservative-free, except for the iögo 0% line. Thanks to unique recipes, iögo has over 40 flavours. As a pledge that everyone will find something to love in this new product line, all iögo products are part of Ultima Foods' "Satisfaction guaranteed or it's free" policy. For more information about iögo, visit www.iogo.ca or follow us on Facebook and Twitter.

In 1996, OntarBio launched Organic Meadow milk - the first organic milk in retail stores in Canada. Today, Organic Meadow has a full line of organic dairy and egg products, including the coffee cream featured at the Dairy Symposium, Organic Meadow products are found in grocery stores right across the country, and the organic sector continues to grow. Organic certification requires that a farm be free from chemical inputs and genetically modified crops for three years. Cattle must be fed organic feed, and the use of antibiotics is heavily regulated with extended withdrawal periods. All Organic Meadow farms are inspected by a third party verification body which certifies them as organic. We expect the utmost in product quality and organic integrity from our producers. In return, our producers receive an organic premium, ensuring sustainability of the family farm. For more information, contact us at 1-866-767-9694 or info@organicmeadow.com

Although not a dairy product
we thank **Blythe Brae Farms Limited,** R. R. 3 Woodstock, ON N4S 7V7
(519) 537-5105, for providing food roasted soybeans.

The South Western Ontario Dairy Symposium is organized by Dairy Farmers of Ontario through its Dairy Producer Committees in Essex-Kent, Lambton, Middlesex, Elgin, Huron, Perth, Oxford, Waterloo, Wellington, Brant, Norfolk, Wentworth, Haldimand and Niagara, in cooperation with the Ontario Ministry of Agriculture and Food.

Brant County	-	*Chris VandenBerg*
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519-688-0605

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1-800-265-3435

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519-842-4841

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1-800-265-9435

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519-266-4824

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1-800-265-5475

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