All inquiries in relation to the management of the Herd ‘13 should be directed to

Esther Price Promotions
PO Box 341, Mundijong WA 6123
Tel: 08 9525 9222; Fax 08 9525 5008
esther@estherprice.com.au

On-site inquiries:
Esther Price 0418 931 938
Carol Millar 0430 211 216

Disclaimer: The opinions expressed in the papers supplied within this booklet are those of the author and not necessarily those of the partners, National Herd Improvement Association, Australian Dairy Herd improvement Scheme or Holstein Australia. Whilst all care has been taken in the compilation of these proceedings, neither the partners nor the conference conveners take any responsibility for the accuracy and content. The program was correct at the time of going to print however the organisers reserve the right to make adjustments to the program.
Welcome to Herd ‘13

Herd ‘13 is a proud, joint initiative of the NHIA, ADHIS and Holstein Australia that features a tailored and innovative program that is aimed at Herd Improvement industry personnel (from field and technical staff through to management) and dairy farmers with a specific interest in using genetics to achieve the next paradigm of farm business productivity gains. Significant investment in this event from the three hosting entities has kept registration fees to a minimum, on the back of a policy of encouraging as many people as possible to attend – enabling you to invest in your own and your staff’s education and professional development.

We trust that you enjoy the program of events.

Conference Contacts:

Event Managers
Esther Price Promotions
Tel: +61 8 9525 9222
Fax: +61 8 9525 5008
E: esther@estherprice.com.au
Site Contact: Esther Price 0418 931 938

Conference Conveners
National Herd Improvement Association
Unit 1/112 Synnot Street
Werribee VIC 3030
Contact: Carol Millar, General Manager
Email: carol@nhia.org.au
Website: www.nhia.org.au
Tel: 03 9742 7244
Fax: 03 9742 7696
M: 0430 211 216

Holstein Australia
24-36 Camberwell Road
Hawthorn East, VIC 3122
Contact: Matthew Shaffer, Chief Executive Officer
Email: mshaffer@holstein.com.au
Website: www.holstein.com.au
Tel: 03 9835 7600
Fax: 03 9835 7699

Australian Dairy Herd Improvement Scheme
Level 2, Swann House
22 William St, Melbourne VIC 3000
Contact: Daniel Abernethy, General Manager
Email: dabernethy@adhis.com.au
Website: www.adhis.com.au
Tel: 03 8621 4240
Fax: 03 8621 4280
M: 0417 514 898

Conference Contacts:
The convenors of HERD ‘13 would like to acknowledge the following companies for their support.

Pfizer Animal Health
Dairy Australia
Dairy Futures CRC
Viking Genetics
Welsh Polo Supplies Ltd.
# CONTENTS

6  Program

8  Why productivity matters  
   *Chris Murphy*

10 Servicing the new herd recording needs of farmers  
   *Neil Petreny*

17 The Genetic Progress Report – building awareness and taking action  
   *Michelle Axford*

20 Growing your customer base and turning data into knowledge for dairy farmers  
   *Uffe Lauritsen*

25 Using data from herd test to develop reliable health traits  
   *Camilla Rosman*

27 Advances in identifying cows with superior feed efficiency  
   *Jennie Pryce*

30 Developing and launching new services  
   *Neil Petreny*

34 What’s ahead in herd test standards  
   *Uffe Lauritsen*

35 Boosting the fertility data chain  
   *Peter Williams*

38 Evaluation and breeding for Body Condition Score. Is it possible?  
   *Rohan Butler*

41 The new multi-trait fertility model and its impact on bull selection  
   *Mekonnen Haile-Mariam*

44 Future Employment in Rural Industries – Y change  
   *Jacqueline Rowarth*

50 Changing times for the USA  
   *Dr. Tom Lawlor*

53 Reasons for optimism on the reproductive front  
   *Joel Mergler*

55 Inseminating cattle with sex sorted semen: Placement and timing  
   *Scott Norman*
DAY 1 TUESDAY MARCH 5

9.00  Arrival and registration

10.00 Celebrating an Australian success story: ADHIS Chair Adrian Drury looks over a 30-year journey of ABVs and challenges ‘what’s next?’

10.10 Why productivity matters – what is Dairy Australia doing to address this? Genetic improvement is integral to the strategy of improving dairy farm productivity, which is why DA is becoming increasingly invested in this space through genomics, the operations of ADHIS and the proposed Centralized Data System (CDS). Chris Murphy, Group Manager of farm productivity and delivery with Dairy Australia puts this all into perspective.

10.40 Servicing the new herd recording needs of farmers: Neil Petreny, from the Canadian-based CanWest DHI, talks to us about how farmer needs have changed over the years and what it takes to respond to the changing demands of dairy farmer customers in a world where rapid technological progress is a given. We can expect some powerful words of wisdom from Canada’s most innovative herd test organization.

11.20 Opening the door called ‘full genome sequencing’ and addressing haplotypes to improve fertility: Ben Hayes, from the Dairy Futures has few peers in this field and we are privileged to have Ben present the next quantum leap in herd fertility.

11.55 Listening to your customers: Holstein Australia CEO Matt Shaffer is front and centre when it comes to restructuring an organization that is 99 years old to ensure that services and delivery models are not only customer-focused but provide business viability as well.

12.15 Lunch – Sponsored by DairyFutures CRC

1.15 Turning awareness to action: Michelle Axford from ADHIS explores the challenge of sparking interest in genetics amongst dairy farmers and their advisors. Her journey takes us through the development of the Genetic Progress Report for farmers and why this will increase farmer understanding in this area.

1:30 Growing your customer base and turning data into knowledge for dairy farmers: HERD 13 delegates are privileged to have the opportunity to hear from International Committee of Animal Recording (ICAR) president Uffe Lauritzen – and his perspective on how herd test is changing in Europe and how organizations are adapting.

2:00 Using data from herd test to develop reliable health traits: Camilla Rosman of Viking Genetics shares with us how the Scandinavian countries have used their data to give farmers a range of health traits in their sire evaluations.

2:20 How technology is helping us tackle the ‘too-hard’ basket: DPI/V/CRC scientist Jennie Pryce has delivered some great work in the area of feed conversion efficiency – yet FCE is a strategy that most farmers have to date put aside under the ‘too-hard’ label. Jennie maintains that with FCE at least, we can present this tool in a manner that has much broader appeal.

2:45 Industry Panel - The role of resellers in Australia: This sure to be a fascinating panel to ask the hard questions. Resellers have been a unique part of the Australian HI system for decades. What is it about their service that ensures it remains a vital part of our industry? We can promise a very interesting line-up of panelists who are passionate about what they do.

3.15 Afternoon tea

3.45 Herd Test Session, chaired by Tony Francis
- Developing and launching new services - Neil Petreny, CanWest DHI
- What’s ahead in herd test standards - Uffe Lauritzen, President, ICAR
- Boosting the fertility data chain - Pete Williams, ADHIS
- What shared data can deliver (a brief glimpse into the Cloud) - Tony Francis, Mistro

3.45 Genetics technical session, chaired by Peter Semmens
- Body condition score work and its impact on fertility - Rohan Butler, Holstein Australia
- Correlations between type and other traits found in new research in Australia - Iona McLeod, Department of Primary Industries, Victoria
- Holstein International recently called the TPI “the world index”. Future directions for TPI and TPI(g) - Tom Lawlor, Holstein Association USA
- The new multi-trait fertility model and its impact on bull selection - Mekonnen Haile-Mariam and Gert Nieuwhof, DPI/V/CRC/ADHIS

6.30 Dinner, Chaired by Graeme Gillan, NHIA – Sponsored by Pfizer Animal Health
DAY 2 – WEDNESDAY MARCH 6

8.00 Arrival and registration

8.30 Chair’s welcome and opening address - Ron Chittick, Holstein Australia

8.40 Future employment in rural industries – Y change? Jacqueline Rowarth, University of Waikato. The world is changing and we need the tools to adapt – an insight into the jobs of the future.

9.10 The Next Generation: A session featuring four new generation professionals embarking on a career in the dairy industry. First we enjoy five minutes each for the Next Gen and then invite a “Y-Change” panel session led by Jacqueline Rowarth. You will be inspired by the talent that is out there!

10.00 Morning Tea

10.20 Changing times for the USA: There are a number of interesting challenges ahead for one of the world’s leading genetics players. Tom Lawlor, from Holstein Association USA will provide an update on the U.S. endeavour to create a public-private venture, whereby, their Council of Dairy Cattle Breeding will take on the service commitment of the genetic evaluation system and USDA will concentrate on research. How will this be done? And, what lies ahead for the delivery of genomic testing in the USA after 2013? We ask Tom, “what now for the world’s biggest player in herd improvement?” This is your opportunity to hear direct from someone best placed to give the answers.

10.50 The flow-on effects of genomics: In this session, chaired by ADHIS CEO Daniel Abernethy, a panel of Australian and international experts will give a fascinating insight and discuss how genomics has changed the way they do business, including:
- The impact on herd testing organizations
- Breed Societies
- Genetic evaluation systems
- Bull companies

12.00 Lunch – Sponsored by Dairy Australia

1.00 Infertility and Management: SelectSires ‘YouTube star’ Joel Mergler (who went ‘viral’ after Herd 11), is back and takes a look at what some herd managers in the USA have done to improve reproductive performance. Joel describes this as ‘concrete advice’ that is proven to turn fertility trends around.

1.30 The value of managing non-cycling cows: Pfizer’s Group Veterinary Operations Manager Dr Tracey Marsden reports on the Pfizer-led study into the treatment of non-cycling cows and how this can overcome infertility.

1.50 How IVF can increase your rate of genetic gain: Simon Walton, IVF Technologies, provides an important understanding of how this latest technology for breeding cows may influence stud breeding.

2.10 Uterine horn AI: Dr Scott Norman, Registered Specialist in Veterinary Reproduction from Charles Sturt University – tells HERD’13 delegates what the science and the research really says about this technique which is one of the current discussion points in AI breeding.

2.30 Biotechnology – the bigger picture: Michelle Gallaher is the Chief Executive Officer of Bio Melbourne Network. Michelle takes us ‘beyond cows’ to ensure we get excited about the future of biotechnology.

3.00 Closing remarks and afternoon tea
WHY PRODUCTIVITY MATTERS

Chris Murphy
Dairy Australia

INTRODUCTION
Productivity growth is ultimately an estimate of improvement in the efficiency with which dairy farmers use inputs (land, labour, capital, feed, etc.) to produce outputs (milk, livestock). Productivity growth is also an important method by which farmers maintain or improve profitability and the international competitiveness of the dairy farm sector.

Productivity should not be confused with “production” – although it often is. Growth in productivity is the growth in total output relative to growth in total inputs. Historically, improvements in productivity have enabled Australian (and other) dairy farmers to maintain profitability under declining terms of trade by offsetting ongoing cost pressures.

While productivity is a performance measure by which industries may be evaluated, for dairy farmers the ultimate success indicator is profitability. Productivity and profitability may not always be linked as improvements in profitability can result from not only growth in productivity but also from price changes. Profitability is determined by two factors: productivity and the terms of trade, which is the ratio of prices received to prices paid. As agricultural output and input prices are determined largely on global markets, farmers have a negligible influence over their terms of trade. Therefore, it is only productivity that farm managers can improve through innovation in technologies and management systems.

Monitoring and assessing productivity growth is a long game – productivity estimates change as outputs and inputs change, and productivity estimates in agriculture can be particularly erratic because of the influence of weather conditions.

WHAT DRIVES PRODUCTIVITY?
The Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) has published annual estimates of total factor productivity for the Australian dairy industry for a number of years. Total factor productivity (TFP), also known as multifactor productivity, compares total outputs relative to the total inputs used in production of the output.

From 1978-80 to 2009-10, total factor productivity growth in the dairy industry has averaged around 1.6 per cent a year. This compares to 1.6 per cent for cropping farms during the same period, 1.4 per cent for beef farms, 1.1 per cent for mixed cropping and livestock farms, and 0.5 per cent for sheep farms.
Productivity growth can be enhanced through two pathways - technological progress and technical efficiency improvement. Technical efficiency improvement includes dairy farmers adopting existing management practices such as better pasture and fertiliser management, improved irrigation management and more efficient milking equipment (e.g. rotary dairies, automatic cup removers).

Technological progress, or ‘shifting the technology frontier’ involves advances in both plant and animal genetics. In plant genetics aims to increase pasture production, nutritive value and persistence. Research in cattle genomics aims to increase the rate of genetic gain in cattle especially in key traits such as fertility, feed conversion efficiency and methane production.

Several factors have contributed to improvements in dairy industry productivity over the past 30 years. Output growth has largely been driven by growth in inputs, particularly fodder and fertiliser. Dairy farmers have made significant changes to maintain and improve production through greater use of supplementary feeding, improved pastures and fodder crops, and more efficient cows. Major factors contributing to the growth in output were identified in an evaluation of pre-farm gate RD&E (Centre for International Economics, 2011). These factors included:

- Increased pasture production and utilisation; - including effective grazing management;
- Increased supplementary feeding to fill feed gaps and maintain higher stocking rates;
- Genetic improvement – increasing the capacity of animals to use higher volumes of feed and to convert feed more efficiently to milk;
- Milk quality (through controlling mastitis) and more effective management of cow welfare.

Rates of productivity growth slow decline in the gains from new technologies slower adoption rates for new technologies knowledge constraints in effectively using technologies to look for new ways to improve management practices and adopt better technologies in order to enhance productivity

Technological regress

**WHAT ARE WE DOING TO IMPROVE PRODUCTIVITY?**

Genetic improvement is integral to the strategy of improving dairy farm productivity, which is why Dairy Australia is increasingly investing in this space through genomics, the operations of ADHIS and the proposed Centralised Data System (CDS).

**REFERENCES**


Centre for International Economics 2011, *The impact of innovation on the dairy industry over the last 30 years: Evaluating the contribution of industry and government investment in pre-farm gate RD&E*, Canberra, November


Nossal Productivity growth: Trends, drivers and opportunities for broadacre and dairy industries
SERVICING THE NEW HERD RECORDING NEEDS OF FARMERS

Neil Petreny
Canada

INTRODUCTION
The dairy industry and the environment in which we operate has changed significantly over the past two decades and the rate of change will continue even faster in the future. This makes the challenges of both dairy farmers and the companies providing services to dairy farmers harder and more dynamic. On-farm technologies are allowing some farms to consider withdrawing from traditional herd testing programs. While at the same time, technology is providing the opportunity for progressive herd testing companies to provide more value added services – particularly as they relate to the testing of milk samples. One of the biggest challenges for herd testing in the future is to find the right structure in a shrinking industry. At the same time, we must also identify the technologies that will allow us to provide services for customers that they either cannot get elsewhere or where we are able to offer the convenience such that it is an attractive option. To make no changes to the traditional herd testing programs and services simply means that you are making a decision to not be in business long term.

HERD TESTING MYTHS
There are a number of assumptions that exist within the industry about herd testing. Many of these assumptions are based on history and others are simply without basis – however they shape our perceptions and influence our expectations of the herd recording sector. Here is a selection of the most common myths and assumptions that we come across in our industry.

- **Genomics will Make Herd Testing Obsolete.** Reality is quite the opposite, and in fact, genomics will require additional and improved data to continually update the genomic equations and to provide for the research and introduction of additional traits. Fortunately many farmers and industry people have done the full circle to realize that this is not the case.

- **Technology is Replacing Herd Testing.** New technology is an opportunity for improvement by both the farmer and the herd testing organizations. Without technology we would not be able to offer many of the herd management tools that are available today. This is of particular importance in the development of new milk tests – such as diseases and the new pregnancy confirmation. Companies that do not adopt new technologies will make this myth reality – those that embrace the right technologies will find that they are valued by the farmers.

- **Herd Testing Doesn’t Work with Robots.** With reference to the integration of robotic milking systems into the North American and European herd recording systems – robots have been easily and quickly integrated into our services. While they present some unique issues and challenges, the basic data and sample collections process have worked well. Currently 4% of our herd test customers have robotic systems and this number is growing quickly. Countries like Denmark and the Netherlands have a significantly higher percentage of robotic systems, but also have a coinciding high herd test participation rate.

- **Herd Testing is for Genetic Evaluations.** This is old thinking. Herd testing should be used for herd management and supporting decisions to make the farmer more profitable. Genetic evaluation is a secondary use of the information. Herd testing services designed and focused specifically on data collection for genetic evaluation will not be able to provide the value and will quickly find interest and participation declining unless it is subsidized.

- **Large Farms Don’t Test.** Again, old thinking. While markets vary, our market statistics show that the lowest use of herd testing, by far, is the smaller herds. The mid-sized farms are the strongest participants and the largest farm segment is average participation. While the cost is perceived as high for some large farms, the potential benefits are also large if the information is used properly.

- **Farmers Like Collecting Data.** While it may appear to some scientists and advisors that more information is better, no farmer has ever asked us to collect more data. And no farmer likes to spend their time collecting data for someone else when it is of no interest to themselves. However, we consistently see that those farms with on-farm software do a significantly better job of collecting and using data than average largely because it is for their own use and not being collected for someone else.
• **Herd Testing Competition is Good.** This common perception is good in theory, but fails in practice – particularly in small and mature sectors such as ours. With less than 4,000 herds on test, there is no reason why this can’t be done by a single well managed company. With such a small marketplace, every time you add new companies, you divert energy from service and innovation to duplicate administration, duplicate transportation and stealing business instead of improvements. The argument for competition is generally that it keeps prices lower – however, if you OWN the business YOU are responsible for making it both efficient and service oriented. Anything less than ideal means that you either have the wrong plan or the wrong people.

• **Lowest Cost is Best.** This is a nice objective – but not realistic. Competing on price means that companies keep lowering prices and making cuts until they no longer have the resources necessary to meet the needs of the customers and then start losing markets because of service quality issues or product limitations. Quite frankly, from a staffing perspective, this strategy generally results in challenges attracting and retaining good people. This cycle repeats itself and contributes to the downward spiral of the company. A good example is related to feed costs. To significantly reduce feed costs – simply stop feeding. Feed costs will drop – but the outcome is not what was desired. There are two morals here: Be careful what you ask for; and, You get what you pay for.

• **Goal of 100% Herd Testing Participation.** This is a typical goal talked about in a different setting. While ideal, it is not realistic and should quickly be discarded. There will always be herds that will not want to test because of ideals, principles or simply perceived need. In fact, every industry has some customers that they do not want. The ones that generate little revenue, but take up a huge amount of resources. Companies should work with the herds that will be in business in the future and let the others utilize the products and services designed for the progressive segment.

• **Our Farmers are Different.** This is a winning excuse for not making changes and particularly useful reason for not supporting consolidation when it is necessary. The fact is that most farmers are the same – they are in business to make a profit. Different geographic regions may require slightly different products and services to achieve this goal, but a well run company will make this happen. Each region can appear to retain their own uniqueness, but at the same time you can create the operational efficiencies necessary for long term sustainability.

• **Small Companies are More Personal.** Another excuse to not make changes. The people of each company are the ones that will determine how you feel about their business. If farmers don’t feel that they are getting the level of service they desire, it is usually a result of the people and company culture. The right people and right organizational culture, combined with adequate resources can make good things happen.

• **Farmers Just Want the Basics.** With a focus on low cost, this phrase is useful for halting all progress within a company. This can also be interpreted as “no changes”. Farmers want products and services that will help them save time and money and assist them in reaching their profitability goals. While this includes the basics, it also means there are a lot of other needs that can be addressed at the same time. Technology will easily provide the basics – and if you don’t offer anything else, you are again making a decision to not be in business long term. This approach is a disservice to both the farmers and the employees.

### THE CANADIAN EXPERIENCE

There are a number of common trends and issues faced by the dairy industry in most developed nations around the world. In Canada they would include:

- **Farmers:** declining herd numbers, increasing herd sizes, increased feed costs, decreased profit margins, increased use of technology and a challenge to find and retain skilled labour.

- **Herd Test and Other Service Providers:** fewer customers, increasing operational costs, increasingly diverse service demands, increasingly demanding customers, limited financial resources and geographical challenges.

### 4 KEY EVOLUTIONARY EVENTS IN THE LAST 15 YEARS

There have been four key evolutionary events that have occurred during the past 15 years in Canada that has shaped our herd testing industry today.

1. **Organizational Consolidation** – through a number of mergers, we have transitioned from 10 herd test organizations to the current 2. The two remaining organizations service between 4-5,000 herds each allowing for the economies of scale advantages.

2. **Single National Herd Testing Platform** – a decision more than a decade ago (by the 4 organizations remaining at the time) to pool resources to build a single national system to meet the needs of each of the partners was a critical milestone. Despite difference in services and needs, compromise and flexibility of new technologies allowed for the development of a single database to service each organization. Our investment in system planning and design was almost as large as our cost for programming. This multi-year and multi-million dollar investment has withstood the test of time. A separate decision to operate from a single location was also a ground breaking decision and leap of faith/trust that has paid off many times over.
3. Unlimited Service Flexibility – utilizing technology for the calculation of production and other herd management parameters by using a variety of different data collection processes has allowed us to design individual service plans for each farmer based on their needs and budget. No longer do farmers have to select one of 5 previous programs available. Today we have more than 80 different service plans in place. Our new challenge is for staff to balance the variety of different schedules requested.

4. Expanded Lab Testing – new and cost effective technology provides the opportunity for herd testing organizations to offer health and disease diagnostic services using the routine herd test milk samples. The strategic advantage of providing additional testing without any additional sample collection costs has been significant. We now offer 8 different milk analysis services in addition to the basic fat, protein and SCC. Our most recent offering is a milk pregnancy test that is receiving widespread interest. The objective is to extract more value/information from the milk sample without incurring any additional collection/transportation costs.

Today the Canadian dairy industry is serviced by 2 large herd testing organizations with defined regions. Our organizations share ownership of a single national herd test software program and we share the cost of a central processing center. However, we still operate with two different data collection programs for field staff and different herd management programs we sell to farmers. We are not yet 100% integrated and regional politics, language and history have slowed progress in these areas.

We take advantage of the strategic alliances that each of us have developed within our regions and often assign one organization to lead the development of new products based on their strengths. Our advantage is our link to the veterinarians for health diagnostics and our partner's strength is related to nutrition and related diagnostics such as milk urea and milk acetone.

We have slightly different visions and strategies. Our cultures and languages are different – and yet we operate as if we are married. Both regions enjoy a strong market presence with an overall average of between 75-80% of herds on test.

WHAT DROVE OUR CHANGES

A lack of resources to meet the changing demands of the farmers, particularly in the small organizations, was a key factor in driving our change. The potential for each organization to invest in upgraded herd test systems was not possible given the large costs. Without the collaboration of the organizations, even the largest organizations could not have funded the final product on their own. The benefit is that today every dairy farmer in the country is better off because of a decision a decade and a half ago.

WHAT HAVE WE DONE?

During the past 15 years we have adopted a number of strategies to build our business to better meet the needs of our farmers.

1. Focus on Herd Management. Our objective is to provide services that help our farmers be more profitable. The only other services we consider are those that will offer convenience and save the farmer time. Industry needs – eg. genetic evaluation – are secondary and they must adapt to the data we use in our regular business.

2. Offer Personalized Services. Investment in our central testing software allows for the flexibility for farmers to design their own services to meet their labour, budget and information needs. This software investment has been one of the best investments we have made.

3. Provide Convenience. Farmers are as busy as ever. Seek products and services that will free up their time. This is not unlike making them more profitable and time is a valuable commodity for everyone – especially today’s farmers. Lab products are an obvious example, but we also provide animal registrations for the breed associations and last year spent more than 4,000 hours submitting applications for 67,000 animals. In addition to saving time, we also saved thousands of dollars in late fees for our good intentioned customers. In the past, Holstein breeders in Canada paid nearly $1M annually in late fees.

4. Use Personal Relationships. We have avoided the introduction of common cost saving measures that reduce customer contact. In particular, we have direct lines to a customer service desk where you connect directly to a real person. This has become a well known trademark for us as most farmers are annoyed with automated phone systems. The second area is that we have purposely avoided removing the field technician from the farm – for either sample collection or pickup. The interaction with the field staff is the primary personal contact with our company and we need to keep a person involved to build and maintain the relationship. Once the person is removed from the service it becomes easier to quit testing. Only in a few extreme remote situations have we provided the fully remote service option. This approach has been a strategic decision.
5. **Service Innovation.** The dairy industry, and particularly herd testing, is a mature market. As such service and product innovation is critical to the marketplace. Without the enhancement of existing products or the introduction of useful new services, the introduction of technology at the farm will exceed herd testing and once a customer is lost it is very difficult to bring them back. Innovation does not mean having to be first, but it does mean that changes are necessary. Borrowing changes designed elsewhere can be just as effective.

6. **Redefine our Customers.** Our farmers are the obvious primary customer, however, we have also added farmer advisors to the list. In particular, veterinarians, nutritionists, reproduction specialists and bankers. Each of these advisors can use our information as part of their service to enhance the farmer’s profitability. This also expands our sales force as they become proponents of our services.

7. **Utilize Technology.** We have made extensive use of lab technology to provide an array of health and disease diagnostics that are not normally otherwise available on the farm. The convenience of using the same milk sample for expanded applications should not be underestimated. We have also used technology to simply the collection of data and to provide on-farm herd management tools. Without technology we would still be collecting information on paper – and from a smaller number of herds. Technology is an important ally in success.

8. **Remove Service Barriers.** Take away the reasons for farmers to not use your services. We have introduced robotic sampler rentals and in some cases purchased sampling devices for farmers to assist with cash flow.

9. **Simple Pricing Policy.** We now price our basic herd testing service at “cost”, different than our historical bias of providing a financial advantage to the specific breeder related service. We price optional services to provide a “margin”. The margins are reinvested into the development of the next optional product and additional revenue streams are used to hold the basic service prices where possible. The collection of any “non-herd test” data for industry or other parties is a chargeable service. Examples include calving ease, milking speed and temperament. Collection of data for genetic evaluation purposes should not be a burden carried by only those using herd test services.

10. **Build Business Partnerships.** We have cultivated relationships with a number of strategic partners for mutual advantages. Examples include universities for milk test validations, software developers for product developments (we are a national distributor) and more recently we have partnered with animal diagnostic labs to integrate their results into our database. This builds value for our farmers and the veterinarians that provide their services. It continues to make our program an integral part of their everyday operations.

11. **Operational Efficiencies.** Shared product development and processing offers the advantage of lower costs without the headaches of operating a duplicate system. We pool purchases of certain supplies and services (e.g. benefits, phone, insurance, internet...) with industry partners to gain the benefits of larger purchasing volumes. We own properties larger than required for our business, but rent out additional space to cover costs. We can’t forget the basics of good business efficiency – the same message to market to our customers.

12. **Cultivate the Future.** We are actively involved with progressive farmer groups and provide our herd management software to universities and colleges so that graduating agriculture and vet students are already training on our software. It is not the only software available, but familiarity is a good starting point for future customers. We also support research activities with in-kind support that may be services of interest to our farmers in the future.

13. **Monitor the World.** Taking advantage of the internet to monitor new developments that may fit our business has never been easier. There are also a handful of conferences and organizations that are industry leading and should be monitored for new developments. If you don’t have the resources to be first to market, we all certainly have the ability to follow closely behind. Learning from the experience of others is one of the most cost effective forms of learning available.

14. **Avoid Self-Inflicted Pain.** We made a conscious decision to not offer a blood pregnancy test due to the conflict with veterinarians – part of our expanded customer segment. Instead, we let others take the lead and as we follow up 3 years later with the milk pregnancy test, the acceptance and understanding is significantly better. We include non-compete terms in contracts with suppliers and have designated service regions in our ownership agreement for our national herd testing software.

15. **Ensure you have the Right People.** Over the years we have made staffing changes throughout the company to ensure that we can deliver our vision. Where individuals do not support the direction or are unable to adapt (think of cows in a robot herd transition) it is important to make changes. Not always easy, but necessary.
**WHAT ARE THE RESULTS**
The following chart shows a 20 year history for the largest region of our company (>3,100 farms). Since the introduction of our first changes in 1997 and the implementation of a fully flexible service offering in 2000, the growth in market share has been relatively constant. We are currently at 78% market share and continue to attract new customers.

**THE 7 TRAITS OF A SUCCESSFUL HERD TESTING COMPANY**
Based on nearly three decades of experience in the dairy industry, I would suggest the following traits to be those of a successful herd testing company in today’s environment:

1. Focus on Herd Management Services
2. Economies of Scale
3. Service Flexibility
4. Product Innovation
5. Leverage Technology
6. Build Strategic Partnerships
7. The Right People

Not surprisingly, many of these traits are also shared by leading companies in other industries. Good business practices are not unique to any particular sector.

**LOOKING DOWN THE ROAD**
Past performance does not guarantee future performance – as such, we should always keep an eye on the future so that we can determine, or at least influence, the outcome.
OPPORTUNITIES
There will be a number of opportunities for herd testing in the future. Each of us will have to identify which opportunity has the best fit for our customers and our companies. Future opportunities will include:

• **Expanded lab testing.** A number of options currently exist including acetone (ketosis) and fatty acid profiles. A number of health and disease diagnostics are also being developed (largely transitioned from existing blood tests). The new milk pregnancy test is an option that should be considered by every herd test organization. Also arriving is herd level disease screening – herd testing organizations have the opportunity to pool cow samples to create a single sample or groups of samples with known contributors. As bio-security issues grow, so will this concept.

• **Increased Testing Flexibility.** We anticipate that at some point in the future we will have to introduce partial herd testing. Dairy herd management is largely focused on the most difficult period: the first 60-90 days in milk. More frequent testing of these animals allows the farmer to keep up with changes. Frequent testing is not required for later lactation animals.

• **Cow Comfort.** There will be increasing pressure on the industry by consumers and processors for ensuring the cows are looked after. We may be involved as a third party in activities such as gait or body condition scoring. Foot health is a huge challenge for the industry – but also an opportunity for herd recording.

• **Continued Consolidation.** We are not at the last step yet. There will be more consolidation within our industry and across the sectors. There is little doubt in my mind that within 10 years we will have herd testing, breeds and genetic evaluations operating from the same location.

FUTURE CHALLENGES
Along with opportunities, there will be challenges to address. These include:

• **On-Farm Generated Data.** How will we handle data generated by on-farm systems? For example, there is currently equipment which will provide fat and protein content estimates – do we mix this with our data? How do we guard the integrity of our database? Do we label it? Who will want it, and more importantly, who will pay for us to collect and store it?

• **Technology.** Related to on-farm generated data, more products will be developed for herd management that will be positioned to eliminate the cost of herd testing. We must similarly leverage the technologies to provide a competitive advantage through our software systems or our milk analysis products. Our plan is to stay at least 5 years ahead of on-farm analysis technologies to separate our business activities. We will also have the opportunity to provide calibrations for on-farm systems that operate in a challenging environment. Technology will always be both a threat and an opportunity.

• **Milk Prices.** Significant changes in milk prices will impact all support industry activities – including herd testing. With existing program flexibility, farmers can modify their services to meet their needs, but management changes will challenge us to seek other tools to meet their new operating strategies.

• **Industry Incentives.** In some regions AI units provide incentives for farmers to herd test. As times and fortunes change within the AI industry, these are likely to be reduced or eliminated. For farmers who have come to rely upon this support to offset the herd testing costs, such changes will result in the loss of farmers who haven’t been making full use of the information because of the subsidy.

CLOSING COMMENTS
Adapting to the changing demands of dairy farmers and the increased presence of technology on the farm is requiring that herd testing companies become more dynamic in the way they operate. A clear focus on herd management services that enable the farmer to improve their profitability must be a strategic cornerstone of the business. Herd testing simply to collect data for genetic evaluation is not viable without considerable financial support.

The dairy industry is a mature market in nearly all developed countries. We each face similar industry challenges. Consolidation of the herd testing sector will be required to match the shrinking industry and is a key to freeing up resources to be reinvested in innovation, technology and people. Innovation is a necessity of a mature market and this innovation must capitalize on technology. Without the integration of technologies into our herd testing activities, farmers will find their own solutions and herd testing will face continuing enrolment declines.

As the industry changes the demand for resources will continue to increase. The advantage of strategic business partnerships cannot be underestimated. Every organization has its strengths and those able to join forces to create synergies and win-win outcomes will grow and thrive.
Finally, the most important factor of all is leadership. This is true of our all business sectors – not just herd testing or dairy. Without the people to make the right, but hard, decisions - change may not happen. Hard decisions are necessary for long term health of any industry or business and are the responsibility of the leaders. The usual concern of farmers is the loss of good (staff) people. This is part of consolidation, but leaders are responsible to the industry and organization – not a particular person. These are the same principles we encourage in our sports teams and with cows on our farms – but it is harder when it becomes personal. Good people will always find a home and those that remain to lead your organizations will be able to focus on servicing the farmers and not worry about their own survival. This message may be blunt – but it is true.

If someone from Australia asked me about a roadmap for herd testing, I would suggest while the road travelled may be different - the destination will be the same: The 4 key evolutionary events that we experienced, combined with remaining organization(s) demonstrating the 7 traits of herd testing success.

Success in the herd testing sector will increase the number of herds on test. More testing will provide more data for genetic improvement. More data will provide better genetic evaluations. Better genetic evaluations and better herd testing services will enhance the profitability of the farmers. More profitable farmers means a stronger and sustainable industry. A win-win-win scenario.
THE GENETIC PROGRESS REPORT
- BUILDING AWARENESS AND TAKING ACTION

Michelle Axford
Australian Dairy Herd Improvement Scheme (ADHIS)

INTRODUCTION
We make choices. Everyday. Our choices are driven by our knowledge, past experience, influence of peers and the environment around us. One of the most important long term decisions on farm is the choice of bull made for every joining. Bull selection choices are permanent and their impact compounds over generations. As it takes several years to see results, it has been difficult to monitor the effectiveness of choices at a herd level. This is further exacerbated by the nature of typical performance measures (milk yield, reproductive performance, cell count, type evaluations etc) which report the result of both genetic and environmental components. To help farmers quantify and see the effectiveness of their breeding choices, ADHIS has developed the Genetic Progress Report. The Report is a within-breed analysis of a herd over a ten year period and illustrates genetic gain for profit, production, type, longevity, fertility and mastitis resistance.

The purpose of this overview is to describe the tool and its benefits to dairy farmers and service organisations.

CONCEIVING A GENETIC PROGRESS REPORT
The Genetic Progress Report concept was developed in collaboration with farmers through several discussion groups who were frustrated because it was hard to see the results of their genetic choices. Early versions of the Genetic Progress Report, which only reported genetic trends for profit and production, prompted comments such as

- I can see the impact of the decision we made to purchase very cheap and low genetic merit semen during a bad drought year. Those cows, and their daughters are still in the herd today and will take a long time to get rid of. (This comment emphasises the importance of making a good decision with every joining).
- I can see the faster genetic gain we have made since I took over the breeding decisions from my Dad. (This is the first time this person was able to visualise the difference in his bull choices)

During the development of the Genetic Progress Report, it became clear that the ability to look at individual herd performance evokes a more strategic level of discussion and focused attention on choosing high genetic merit bulls – for every joining.

Collaboration with groups of service providers identified a number of uses for the Genetic Progress Report in their businesses. Herd test centres recognise the value in building on herd recording data that was already being collected. Bull companies have identified opportunities to work more closely with their clients to identify focus areas in their breeding programs. Dairy advisers working in specialist areas, such as fertility, see the Genetic Progress Report as another tool to help lift on-farm productivity.

Through the development and consultation period, the Genetic Progress Report has evolved to include a range of benchmarking parameters, genetic merit trends for multiple traits and an analysis of those trends which will provide benefits to farmers and their herd improvement service providers.

THE GENETIC PROGRESS REPORT – FOR FARMERS.
The Genetic Progress Report offers a farmer their own herd's genetic picture with little extra effort.

For most herd recording farmers there are not extra jobs and no extra forms required to access a Genetic Progress Report. For most farmers, the Report will be easily accessible through herd test centres. Your herd information which is collected through regular herd recording is routinely used to produce the cow ABVs upon which this Report is based. As is the case for all ABVs, the Report is independent and backed by strong science.

A Genetic Progress Report illustrates the impact of bull choices 'on my farm'. For most farmers, the Report demonstrates and re-enforces the steady improvements they have made in the areas their breeding program has focused on. At the same time, farmers can compare themselves against the national average and the top 10% of herds in the country (figure 1) and make a choice about what traits might become a focus when selecting bulls.
Components of profit, such as fertility, longevity and mastitis resistance can be very difficult to monitor at a herd’s genetic level. The lower heritability of this group of traits (Pryce et al., 2010) means that the animal’s environment and management can cloud our understanding of genetic changes in a herd. As the Genetic Progress Report is based on ABVs, it focuses only on the genetic component. It provides a longer term view of the hidden gains (or losses) that have been made in these areas of growing interest such as those in figures 2 and 3.

Figures 2 and 3 An example of a Genetic Progress Report – fertility and longevity graphs

Back up the Genetic Progress Report is the Good Bulls Guide that provides lists of highly ranked bulls for the traits and index illustrated in the Report. These two tools provide a pathway for farmers from awareness of their herd’s current trends to action in making future bull selection decisions.

THE GENETIC PROGRESS REPORT – FOR SERVICE PROVIDERS.

The Genetic Progress Report offers herd improvement service providers a value-adding opportunity to their existing range of services.

Herd test centres will soon be able to provide their clients with this new analysis tool using existing data sources. The Report builds on their many years of commitment to data capture. It provides another point of engagement to help their clients build stronger herds for the future.

During the development phase, it was clear that the Genetic Progress Report instigates further interest in bull choices. Bull choices are the main driver of genetic gain on most farms. The Report provides a visual picture that raises the awareness of the impact of past choices. The Report lays a firm foundation for discussions around both the quality and quantity of semen to be used in future joinings.
SUMMARY
The Genetic Progress Report has been a key development activity to raise awareness of genetic trends within a herd and prompt targeted bull selection choices to improve the next generations. The Report will provide herd-specific feedback to Australia's herd recording dairy farmers. Its use in high profile herds as ‘case study’ farms will have a positive flow-on effect about the importance of bull selection to non herd-recording herds. Herd improvement service providers benefit from a new tool that value-adds to existing herd recording practices and instigates interest in bull choices. The Report is a practical output of ADHIS and Dairy Australia’s investment in genetic evaluation, genomic technology and genetics extension.

REFERENCES
GROWING YOUR CUSTOMER BASE AND TURNING DATA INTO KNOWLEDGE FOR DAIRY FARMERS

Uffe Lauritsen  
Danish Cattle Federation

A LITTLE BIT OF HISTORY
As humans we have a tendency to look at big groups as each member is a clone the one next to. This also counts for us when we look at other parts of the world. Through the development of the European Union, people from outside Europe, identifies anyone from Europe as a EU citizen, and not as much as Dutch, German, Greek, Swede, Italian or other distinct part of the area.

The app. 30 countries in Europe have a lot of similarities, but for sure also some differences. This also counts for agriculture.

GENERAL DIFFERENCES RELATED TO AGRICULTURE

• Importers or exporters
• Given conditions (poor or rich soil, flat land, hilly or mountain)
• National agricultural politics
• Private or public service (herdbook and recording)
• Public funding

DIFFERENCES RELATED TO THE AGRICULTURAL COMMUNITY

• Herds and farmers
• Local traditions and cultures
• Farmer versus private controlled industries
• Organizations (breeding, advisory)

All of these points have a huge influence on how the breeding and recording has been organized. Another important point is that in general the small countries have been net exporters and the larger countries net importers of food. The impact from this is that smaller countries like Netherlands and Denmark have been oriented to the outside world, and always measured their own performance against colleagues in other parts of the continent.

TESTING IN EUROPE
Herdtesting in Europe started around 1900. It was a bit different who took the initiative. In some parts it came out of a goal to select animals for more profits, and in other parts of Europe the idea was to feed more efficient. In my own country it came from the latter. A guy had noticed that there was huge difference in the amount of milk between cows fed the same. He wanted to feed more efficient. Relatively soon they discovered what has been common knowledge since – there is a genetic difference.

ORGANISATION

Here more than 100 years later, we still see the reminiscence of the type organization decided then.

Those who were founded on public initiative and still not fully out of it, do have some challenges now when technology in and around recording develops very rapidly.

For those who started as farmer founded and driven (or went to here over the years), it is easier to adjust to daily challenges and to follow the farmers in their continuously improvement of the farm.

Another sign that shows development is the size of your organization (herds and cows). In some areas nature does not give you too many choices, you may be restricted by mountains or simply the fact there are only few herds.
If we today look around Europe and see who has the most efficient service, there is no doubt this is closely linked to the ability and will to work on organisatorical issues.

So far some initial facts and comments.

The value of a recording organization is reflected through the service we can provide to members. Apart from a bit of hardware, most of the asset in recording is the knowledge and experience sitting in the heads of the employees.

- Herds get larger
- Technology moves fast
- Strategic decisions become more crucial
- Herd testing is a complex industry

For that reason it is important for the boards to have constant focus on the business, to enable the best heads and hands to find it attractive to keep or seek job in the business.

**ECONOMY IN MILK PRODUCTION IN EUROPE**

One the thing that characterizes farmers around the globe is that even though this year may be poor, the hope remains. Optimism is always good and can carry us a long way, especially if the cash that come with it, may cover the holes.

Now and then someone dare to foresee that milk prices over the next some years will go up with 20-30%.

What we know is that today's bill have to be paid with today's milk check. This means that the leftover will be between income and expenses.

In the recording world one of our most honorable duties is to provide with information and tools that can help to enlarge the gap between the two points.

The main focus must from recording organizations and service providers are on:

- Issues that helps to improve the value of information
- Issues directly linked to reduce the use of manpower in daily production (time is money)

**WHAT ARE WE TALKING ABOUT TODAY IN THE EUROPEAN RECORDING SOCIETY?**

If you listen to a discussion between keen individuals in herd testing to day, and compare with only ten years ago, the topics and target has changed completely.

Over the latest 10 years technology has developed rapidly, not only what type of tools we use in our daily work, but also, and may be especially, for all the various tools and gadgets farmers today either have or have access to.

Traditionally data for breeding and management have been more or less the same. With all the new sources of data, this may change. Because short term focus will be more crucial, and long term issues is dealt with by other data, or data “translated” into other definitions.
DATASOURCES (NOT PRIORITIZED):
- Genomics
- Heat indicators
- Numerous monitors around the farm building
- DNA tests on milk samples (PCR and others)
- Elisa tests on milk samples (Johnes etc.)
- Robotic systems with enormous daily data capture

All these tools can only give us some data. The challenge is to translate and combine into valuable information and decision tools.

DOCUMENTATION
Another point of huge interest and actuality for recording is the pressure on farms for documentation to the outside world.

This includes partners only linked to the individual producer, such as financial institutes and insurance. Looking into the farm through the farm gate, many pair of eyes is keen to know what is going on:
- Environmental and effluent topics (Local authorities)
- Animal welfare (public in general, processors of farm products)
- “Friendly farming” (So called nature lovers)

The 2 first points are relatively easy to handle. It is a question of observing, noting and then sum up somehow. A lot of this can be based on data traditionally captured and stored for herd testing and breeding purposes.

For the last point it becomes more difficult. What is seen depends on the eyes who watch. What we insiders may see as a relatively disorganized and untidy farm, may with a different view be judged as a nice place. Could be because the farmer was so nice.

In any case the European farmer is facing a lot of questions from the entire circle around the farm.

There are a lot of different technologies that can help us with this documentation. The challenge is to collect data from all these sources, and to validate the content.

MANAGEMENT BY DATA IN THE CLOUDS
As mentioned before in this paper, there are numerous sources of valuable data. Some of it very close and easy accessible, whereas other parts could only be reached on a distance.

If you look on the figure below, it symbolizes the situation where the farm manager sits in the middle and looks around on all the small clouds. Each of them contains information about individual animals, the full herd or the entire operation. In the daily operation where focus may be on selected topics during the day, the clouds may each and all give good information, but in the overall management fragmented datasets does not bring value back matching the investment.

In the farm office we may have solid data from the parlor, milk and could be some indication of fat and protein level. We also have proof information of the feeding of cows. Despite all these facts and a decrease in daily milk production, we still do not know why it falls. Could be that a combination of all those data with info about the inside/outside temperature and other climate data, could tell us a lot more.

For recording organizations working on behalf of members and customers, the fragmented way of storing data, is a challenge and as chair of ICAR for sure something we need to address.
DATA IS POWER AND DATA IS MONEY
When we look at the way of dealing with various sources of data, we must be clear that data and software in many cases are much more valuable than the hardware that comes with it.

Where to store data and who to give access and rights, may vary and even conflict. Here are some examples of different solutions and directions.

• European dairy farms may look more or less the same, but are very different. Therefore farm automation points to individual solutions.

• Documentation points to storage in the cloud – controlled by farmers. What is tempting here is the fact that someone else is taking care of all the data specific issues. For those of us only interested in the cow, we see all this data administration as being boring and for sure waste of time. We would be quite happy if it was handled by IT people.

• Commercial partners want data in their own cloud (milkmachine producers, pharmaceutical world, breeding companies). The commercial world is moving from hardware to software and data. For the farmer it is important that the equipment does the job, and that the supplier can help when it fails. For any commercial company the dream is to be exclusive. This is for sure not an ideal for the customer.

• Development in analytic methods points to more use of off-farm services. There will be development of on farm solutions for some widely and general accepted parameters, but these will slowly lose importance, because the need for more specific and sporadic analysis (mainly veterinarian topics) is rising. Traditional recording and use of central labs, will change and move towards more individual services tailored for the individual farmers or groups of farmers.

• Animal health and welfare points to more open and shared databases. If the thesis of more documentation will come through, this can only be achieved by open/semi open databases and cross use of data

At the end of the day, all of us need correct and valid information. The question is how to get it and how to use it.

WHO OWNS THE DATA?
This is a question that comes up now and then, and is handled differently across Europe. Legislation is not exactly the same, and structure of recording industry also varies.

As mentioned in the section above, data produces value and we must be aware that this value falls into the right pockets. Or at least the majority of the value. The right pockets are here defined as the farmers.

Looking into ownership of data, it is important to select between right to access, right to copy or definite ownership.

On farms with very sophisticated equipment such as milking robots the first priority for the herdsman is to get the cows milked, 365 days a year. Today you cannot have such a machine unless there is a high speed internet access. This enables the service personnel from red, blue or green companies to carry out remote services and also guide during breakdowns. This access also includes a right to fully copy of all captured data.

As far as I know there is no real standard how to deal with it. In the worst case, we could imagine the farmer having to pay for services and add-ons based on data captured by his own equipment. Even through service sessions he also paid for.

Further on, these data could be subject to trade behind the farmers back, and end up in a total different loop, where he does not only have to pay for it again, but also for the added value when these data have been merged with details from other clouds based on farm data capture.

MILK SAMPLES – THE HOT TOPIC
All over Europe there are a lot of running services, initiatives and projects to increase the use of milk samples for additional tests. Some of these for on farm use, some for documentation and some for eradication of various diseases:

• BHB, Acetone
• Johne’s
• Salmonella
• PCR
• Pregnancy checks
• IBR
• BVD
For most of these, especially those related to veterinary issues, the logistics from the cow to the lab is essential. The work on this logistic chain is a challenge itself. In some areas a total rebuild of the whole chain is needed.

**ON FARM EQUIPMENT**
Looking into the dairy farms, there is no visible signs of a revolution as far as the recording and related equipment are concerned. The main change over the last 10 years is the penetration of milking robots and what comes with it.

Number of farms that invest in the extra and highly technical equipment is still rather limited, though there are differences around the regions. Some areas are relatively hard hit by the economy in general, and others carry the burden of investments over the latest 4-6 years.

One of the lessons from this period for all active farmers is not to spend more than you have. This restrains the interest of investment in much more than the basics.

Talking to farmers they are very much aware not to by equipment or gadgets that will only take time, add costs and produce no value. Especially they are focused on the use of time for getting the most out of it.

**CONCLUSIVE REMARKS**
Concluding on the pints above, there is no doubt that the recording has a future worth dealing with and also attractive for young people.

Leaders of the industry must be aware of the responsibility to give and take, and also to create an environment where both farmers and all their supporters with equipment feel safe in exchanging views and informations.

None of us can survive without the other.

I am sure there is enough power out there to bring us forward.

The farmers deserve it.

In my presentation I will come closer to some of the examples above.
USING DATA FROM HERD TEST TO DEVELOP REliable HEALTH TRAITS

Camilla Rosman
VikingGenetics

INTRODUCTION

In the Scandinavian countries we have been unique when we talk about breeding for health traits. We have from the very beginning put a lot of weight on health traits in our breeding goal and today many countries around the world have followed what we have done for the last 40 years.

For many decades genetic progress of the dairy cattle was based nearly solely on the milk production traits. At the same time as genetic potential for milk production is increasing, the general robustness of the dairy cow is decreasing. This happens because the genetic relationship between production and functional traits (such as fertility and resistance to the diseases) is usually negative. Today we move towards big herds where management puts higher requirements on the cow functionality, because of tougher environment and less time used per animal. Sick animals cause economical losses for the farmer due to increase of veterinary treatments, discarded milk, more labour and involuntary culling. Therefore most of the breeding companies now turned their focus towards breeding for functional traits. The functional traits are now included in total merit indexes of most countries with developed dairy industry. However it is a challenge to get reliable breeding values for functional traits because of low heritability, poor quality or lack of data for these traits. Therefore the experience from Scandinavian countries can be interesting since we have worked with it for a long time.

GETTING DATA IS CRUCIAL

Including health traits into the breeding programs of Scandinavian countries became possible because of availability of accurate data on veterinary treatments. The veterinarians’ reports about the treatments are the routine procedure for Scandinavian countries. Moreover, the veterinary rules in Scandinavia are very strict, where only veterinarians are allowed to ordinate antibiotics, and they are forced by law to register all treatments on a cow. Therefore the highly reliable veterinary records in Scandinavia allows e.g. include actual mastitis treatments as a predictor of mastitis resistance, while most other countries relies only on somatic cell scores.

The uniqueness of the data collection in Scandinavian countries is also in the fact that all data are going into the same central database. We have registrations from farmers, from veterinarians, from slaughter houses, from hoof trimmers, from milk analyzing labs, from classifiers, from technicians, etc.

When breeding for health traits it is important to have big daughter groups, approximately 130 daughters, to get enough reliability because of the low heritability on these traits.

NORDIC TOTAL MERIT INDEX

The Nordic Total Merit (NTM) is a relative new total merit index and is a result of the merger of the Scandinavian cattle breeding programs, where Denmark, Sweden and Finland merged their national breeding companies to one – Viking Genetics. Viking Genetics is a breeding company owned by 30 000 dairy and beef farmers in Finland Denmark and Sweden. Today we have more than 600 000 Holstein cows and about 360 000 Red cattle in milk recording. About 90% of all cows in our three countries are milk recorded. To build up the common Nordic index was relatively simple since all three countries have similar data collection systems and breeding goal with big emphases on the functional and health traits for decades.

The main breeding goal for the farmers in Scandinavian countries is the most profitable cow. The profitable cow does not need to be the best looking cow in the herd, or not even the highest producing cow in the herd. The most profitable cow is a cow that easily gets pregnant, have good health, produce lots of milk with high components and have a functional conformation.

The current NTM for Holsteins has 33% weight on production (with highest emphasis on protein production), 50% on fitness traits (including daughter fertility, calving ease, mastitis resistance, resistance to other diseases and hoof health) 13% for conformation (udder and feet and legs) and 4% for workability (temperament and milking speed). NTM only
includes traits that have an impact on the economy of the farmer and the proportions between different weights are justified by the best possible economy of the modern dairy farm. The traits we cannot prove a positive economic impact on the cow are not included in NTM.

**HOOF HEALTH IS A NEW TRAIT**

One of the latest improvements of the Total Nordic Merit index was the including the new trait - hoof health. The Viking Genetics was the first company in the World to include the hoof health in the total merit index in 2011. Before it was difficult to get hoof health data because most of the treatments are performed by professional hoof trimmers and not veterinarians, and therefore data were not available in the central database. Nowadays the hoof trimmers are organized to provide the records for the hoof health on unified form, using an electronic recording device, providing the data directly to the central database. Most of the cows are trimmed twice a year and the total number of records is about 500,000 per year. Today more than 500 bulls have a breeding value for hoof health, including more than 300 Holstein bulls. Hoof health is a new promising trait which will improve the profit of the Scandinavian dairy farmers. The lameness problem, due to poor claw health, increases in the modern dairy farms worldwide and causes serious economical losses. The use of conformational traits for feet and legs to improve hoof health showed to be ineffective through the years. Genetic correlations between feet and leg conformation and hoof health are generally low and therefore direct selection on hoof health is more promising. The hoof health index was shown to have a better correlation with longevity than feet and legs conformation does and therefore it is a more valuable parameter for the improvement of the modern dairy cow.

**CONCLUSIONS**

It is difficult to achieve a great progress in selection for functional traits because of their low heritability. However, we see a large genetic variability in these traits. The experience of Scandinavian countries shows that it is possible to combine breeding for better health together with keeping high level of the genetic progress for milk production. Scandinavian cattle breeding programs are the good example of how good registrations, cooperation, the central database, and the big daughter groups can insure a progress in improvement of the low heritability traits. Breeding for health traits is to breed for a profitable cow, trouble free cow which is invisible in the herd. And our farmers love invisible cows!
DO CALVES VARY IN THEIR FEED EFFICIENCY?
Residual feed intake (a measure of feed efficiency) was calculated on 903 six month old Holstein-Friesian heifer calves by measuring dry matter intake of cubed lucerne hay and live weight gain over 70 days.
Calves had DMI (mean ± SE.) of 8.3 ± 0.05 kg DM/day with live weight gains of 1.1 ± 0.01 kg/day.
The most efficient calves (lowest RFI) ate 3.0 kg DM less each day than the least efficient calves (highest RFI) for the same rate of growth, with a heritability estimate of RFI of 0.27 (±0.12).
Substantial genetic variation in RFI exists, and the magnitude of this variation is large enough to enable this trait to be considered as a candidate trait for future dairy breeding goals.

DO HIGHLY FEED EFFICIENT CALVES GO ON TO BE HIGHLY FEED EFFICIENT COWS?
Residual feed intake was determined on 58 first lactation cows identified as inefficient and 50 identified as efficient at 6-9 months by measuring dry matter intake of cubed lucerne hay and grain, milk production and live weight change over 32 days.
The correlations between calf and lactating cow RFI were r=0.34 (efficient group, p<0.01) and r=0.17 (inefficient group, p=0.10).
This analysis indicates that, on average, highly feed efficient calves go on to be highly feed efficient cows.

STOP PRESS: Recent analysis of the combined datasets from both Australia and New Zealand have conclusively shown that highly feed efficient calves go on to be highly feed efficient cows (joint cross-Tasman scientific paper in preparation).
This important result indicates that DNA markers for RFI derived from growing heifers can be used to predict genetic merit for RFI during lactation.
Feed conversion efficiency of dairy cattle is an important component of the profitability of dairying, given the cost of feed accounts for much of total farm expenses (Ho et al., 2005). Residual feed intake (RFI) is a useful measure of feed conversion efficiency as it can be used to compare individuals that differ in level of production during the period of measurement. RFI was defined as the difference between an animal's actual feed intake and its predicted feed intake which was determined by regression of dry matter intake (DMI) on live weight and growth rate.

Nine hundred and three Holstein-Friesian heifer calves, aged between 5 and 7 mo old, were sourced from commercial herds from across Victoria and measured for RFI (Williams et al., 2011). Calves were housed under feedlot style conditions and had ad libitum access to cubed lucerne hay. Intakes of individual animals were recorded via an electronic feed recording system and live weight gain was determined by weighing animals once weekly, over a period of 70 days. Calves had DMI (mean ± SE.) of 8.3 ± 0.05 kg DM/day over the measurement period with live weight gains of 1.1 ± 0.01 kg/day. In terms of converting feed energy to maintenance and growth, the most efficient calves (lowest RFI) ate 3.0 kg DM less each day than the least efficient calves (highest RFI) for the same rate of growth. The heritability estimate of RFI was 0.27 (±0.12).
These results show that substantial genetic variation in RFI exists, and that the magnitude of this variation is large enough to enable this trait to be considered as a candidate trait for future dairy breeding goals. As feed intake is expensive to accurately measure on large numbers of animals, feed efficiency is an obvious candidate for genomic selection. The idea is that a genomic prediction equation is calculated using data on a subset of animals that are genotyped and also
have measurements on the trait(s) of interest (in this case RFI). The genomic prediction equation can then be applied
to animals that have genotypes but no phenotypes. So, in principle, genomic breeding values could be calculated for
any animal that is genotyped. A genomic prediction equation has been derived from the combined growing heifer data
from Australia and New Zealand. With ADHS we are now working towards launching genomic breeding values for feed
eficiency.

The next phase of the research tested whether calves which are efficient at converting feed energy to maintenance and
growth also become efficient at converting feed energy to milk.

One hundred and eight heifers that were divergent for RFI were tested to determine if the difference was maintained
during their first lactation. The hypothesis was that lactating primiparous cows previously identified as being divergent
in RFI as growing calves (Williams et al., 2011) would still differ in RFI during lactation. If confirmed, the genomic
prediction of RFI in growing heifers (Pryce et al., 2012a) could be used to select breeding animals with higher genetic
merit for RFI as lactating cows.

The lactating experiment consisted of 58 first lactation cows identified as feed inefficient and 50 identified as feed
efficient at 6-9 months. RFI was determined by measuring dry matter intake of cubed lucerne hay and grain, milk
production and live weight change over 32 days (Pryce et al. 2012b).

There was a divergence for RFI between the 2 groups (Figure 1) and there were correlations between calf and lactating
cow RFI were r=0.34 (efficient group; n=47; p<0.01) and r=0.17 (inefficient group; n=57; p=0.10).

This analysis indicates that selection for RFI derived from measurements made in young growing heifers will, on average,
lead to improvements in RFI in primiparous cows. However, the experiment was based on relatively small numbers of
cows. More data are required to understand the genetic relationship between growing heifer and lactating cow RFI and,
consequently, enable calculations of the response to selection expected in lactating cow RFI from selecting on growing
heifer RFI. Before it is possible to implement this trait as a selection objective, genetic correlations with other traits of
economic importance are required, most notably fertility, which may be unfavourable if the calculation of RFI does not
sufficiently capture variation in body tissue mobilisation.

Figure 1: A box-plot of residual feed intake (RFI) in lactating primiparous cows grouped by their RFI as growing heifers
across both cohorts.
ACKNOWLEDGEMENTS
Funding for this project is provided by the Gardiner Foundation and Dairy Futures Cooperative Research Centre, Melbourne, Australia.

REFERENCES


DEVELOPING AND LAUNCHING NEW SERVICES

Neil Petreny
Canada

PROCESS OVERVIEW
In general, we follow the standard four P's of marketing – Product, Price, Place and Promotion. Of these four areas, the majority of our time is spent on the product development area of the process. Product development is a lot like heifers in a dairy herd, they are the future of our business and must be looked after carefully and not taken for granted.

As a rule of thumb, we target for a single new profile product introduction each year. This timing allows us to focus our efforts on the marketing of the new product and we use this opportunity to initiate and hopefully create long-term awareness of the product. In our market, farmers generally are busy in the fields during the summer and more available in the winter period. Ideally we would launch a product in the fall and use the winter for promotion and sales emphasis. Product development does not always allow us to keep an ideal schedule, so on occasion we will have a spring introduction and then plan for a concentrated launch in the fall period.

PRODUCT DEVELOPMENT
This is one of our key business activities – planning for the future. We are operating in a mature market characterized by a declining customer base and an increasing presence of technology that could replace our traditional business activities. As such, product and service innovation is critical to our long term survival.

Our business is structured in such a way that we have a one division that is responsible for both marketing and field/customer services. The objective is to ensure that anything directly touching the customer is managed through one division so that we can ensure a coordinated approach and avoid any uncertainty in who is responsible. As well, the customer contact ensures that the idea screening process is based on real customer feedback and knowledge. This is not always possible when you have the involvement of simply a R&D or IT department leading the priority setting.

We have always had more ideas than we have had the time or money to develop and introduce. The advantage of a broad pool of ideas that it affords us a number of choices to evaluate in order to identify the best fit for our strategy and any current issues in the industry. Ideas general come from people within our organization, on occasion they come directly from customers and the balance of ideas will come from industry conferences, suppliers and colleagues in different geographical regions.

As a general practice, we seek products that will enhance the profitability of our farmer customers by allowing them or their advisors to make better herd management decisions. As well, products need to have sufficient value in order to allow us to recover our costs and a profit margin. Once identified, the potential products move to the next stage of prototyping, validation or field testing. We try to consider questions that will be asked during the sales process to ensure that we have the appropriate answers available.

Related to our development process is our relationship with universities. At any point in time we generally have at least one ongoing graduate project involving our database and usually farms. Many of the projects over the past decade have been related to health and disease and we have used a number of these as part of our product development process. Students usually are funded by outside parties and we provide in-kind support for analysis or data collection.

Another cooperative development approach we have is with the other large herd testing organization in Canada. We have found that it we each have specialized connections and expertise and as a result we have tended to let one group lead a development area and the other will contribute as necessary or simply adopt for their region. This process allows us to share the cost of develop, accomplish twice the work without the staff costs and learn from others experience without having to repeat the mistakes.
PRICE
This is a relatively straight forward process for us. Our practice is to price based on value. We do this by determining our best estimate of the sales volumes and the associated costs. We also consider what other competing products or services may exist in the marketplace (e.g. lab tests or software). With this information we then assess the particular value of the new service and how price sensitive the market may be. This step is a little more art than science.

Our objective it to price services to return a profit. The profits are then used to support the development of future products. If we can’t make a profit, then we will generally not proceed or we will make a conscious decision as to whether or not such a product would be considered as a marketing investment/expense. This outcome is rare.

PLACE
Getting product to the marketplace is also straightforward in our business. Nearly all of our products are delivered direct to farmers and are supported by our own staff. With the introduction of additional health and disease testing services during the past 7 years, we have seen in increase in the number of veterinarians encouraging customers to use the services. In all cases, we have made it a requirement that for health and disease testing a copy of the results are sent to their vet for their information. The farmer then decides whether or not they will spend any time on the results with their vet, but this process has helped build our relationship with the vet community.

We will often consider introductory pricing incentives and discounts, but generally keep our initial list price sufficiently high to avoid having to increase the price if the volume is less than expected. We also try to avoid price increases in the first few years of a new service introduction as we are working to build market share and awareness. However, if the volumes are significantly exceed our estimates, we always have the ability to reduce the list prices due to the good news story that demand is higher than expected.

PROMOTION
This aspect of product introduction is the one that varies the most and is product and timing dependent. We consider the primary user of the product and what other parties or advisors may be involved or affected by the new product. Health and disease related products have had potential implications for veterinarians and feed management software products have possible implications for feed suppliers. Ensuring that we have the support of affected advisors is important and depending upon the product, will involve communications with the advisors in order to ensure their understanding of the new product and its possible applications and implications on their business. Generally we hope to have a positive impact on their business – but this is not always the case. An early example involved milk urea nitrogen (MUN) which was perceived by nutritionists as a tool to identify their ration balancing deficiencies. This concern was particularly widespread by the less knowledgeable consultants.

Most new products are introduced to farmers directly by our staff and with the support of marketing materials and news releases. We generally take advantage of the media for providing announcements and related articles on our products.

PRACTICAL EXAMPLES
I will provide two recent examples. Both are new lab services: BVD and Pregnancy. One has gone well and the other did not have the success we anticipated. In both cases I will focus on the key aspects of the introductions.

Introduction of a BVD Herd Screening Service
The new service was to be a starting point for whole herd screening – a new concept for our customers. The service involved the pooling of up to 250 animals into a single sample – which could then be run with a DNA test due to the high level of sensitivity. Only if the sample was positive would we have to then run smaller pools and finally individual cows in order to find the Persistently Infected positive animal. The concept was for a low cost herd screening tool that could be done once or twice a year.

Research indicated that there was a high degree of awareness about BVD and the potential impact on reproduction. A large percentage of herds were vaccinating to protect their herds as best they could. We spent a considerable amount of time with pharmaceutical companies and did field trials to ensure that our DNA test would not be affected by vaccinations. The outcome of trials indicated that there were no issues. This information was necessary to address questions from both vets and producers. We also knew from research that about 2% of herds would have a positive animal. This meant that 98% of the tests that would be carried out would come back negative. Our assumption was that for about $80 per herd screen, this would be a low cost insurance policy to supplement their vaccination protocols.
With the expectation that there was a high level of awareness of the disease and an underlying concern about the impact of positive animals, we went to market using our traditional channel of our staff approaching farmers to utilize the test to monitor their herd's status.

The outcome was less than desirable. We had set a goal of having 20% of our herds try the test in the first year. Our actual results were about 3%. So, what happened?

As the year progressed and the sales figures were considerably less than anticipated, we spent time with vets and farmers to try to get a sense of why the interest was so low. Our conclusion was that since vaccination was widespread, farmers and vet did not consider this to be an issue based on the assumption that vaccinations were 100% effective. We know this isn't true as each animal reacts differently and in many cases the vaccine handling and administration practices were less than ideal. Our assumption that a high level of the disease awareness would drive the market was wrong – and it was over-ridden by the assumption that vaccination was a complete answer. The other issue we uncovered was that some farmers with closed herds assumed that they were not at risk. Also untrue, but perception is more important.

In two regional projects undertaken during the same period, we screened 100% of the herds in two provinces for BVD, along with each of our other disease tests. The results supported the research prevalence estimates of a 2% infection rate as our results from the ~500 herds was the same. The positive herds included both vaccinated and closed herds.

In hindsight, we should have integrated more awareness to farmers and vets of the risks that exist in both vaccinated and closed herds.

A New Milk Pregnancy Test

This highly anticipated new service was introduced in mid-January and the project has been both exciting and challenging. Exciting from the perspective of it's potential to assist with farm management decisions, and challenging from the perspective that it will displace veterinary revenues from the traditional palpation service. We have worked hard for two decades to build our relationship with the vet community and our exciting new service had the ability to eliminate much of our efforts.

4 years ago we made a conscious decision to not offer a blood pregnancy test based on the fact that it would compete with the vet business. We watched as AI and private industry introduced the service and made marginal inroads. For us, however, this was the start of what we knew would eventually become a service for our herd test samples. We didn't realize how quickly it would arrive.

As with all of our lab related products, we conducted field trials with the veterinary college of our regional university. We deemed the results from a Canadian study necessary to help us market the product with vets and prove that it does actually work in our conditions. The study has been accepted for publication and a summary was used for our early conversations with vets.

Knowing the product worked, we focused our efforts on market positioning. We decided to position our test at a recheck in the 60-70 day range and as a dry off check to ensure that animals were pregnant. This position was intended to complement the early pregnancy checks provide by vets in the 30-40 day range that were often conducted by palpation or ultrasound. We named the test Recheck 60 to reinforce the market positioning, even though the test has a label claim of 35 days post breeding.

Prior to any formal announcements to staff, farmers or industry, we spent about 6 weeks meeting with each of the major vet clinics in our service region to provide them with an overview of the product and our intended market positioning. During our preview meetings we focused on our intent to position the test as a recheck and dry off test and not directly as a competitor in the early check arena. We confirmed that they would receive a copy of all test results for their clients and also provided test accuracy information from both the manufacturer and our vet college project to eliminate future rumours or misdirection regarding efficacy. As anticipated, we received a variety of responses from the vets – but overall the reception was positive and appreciative of our efforts to keep them informed.

As our meetings with vets proceeded, a number of them started to discuss the possible test application with their customers. This lead to our next step of informing staff of the upcoming service and then a details information session with staff on the test and planned service details. At this time promotional information was provided to staff about 6 weeks prior to introduction in order to provide time for them to talk with each of their customers about the new service and give them time to think about it prior to introduction. 1 week prior to introduction, additional service information was mailed to all farmers.

We anticipate that there will be a number of farmers that will wait for short while to hear about how well the service is working. We had set a goal of 10,000 samples for our first 9 months.
In the first week of operation, we received over 500 samples – which would put us on track for 25,000 this year. This is positive, but the other more interesting outcome is that we have customers considering increasing their testing frequency to integrate the pregnancy test into their routine. We are finding that herds with difficult access to vet services, generally more remote, are planning to use the test as their primary pregnancy confirmation service because of cost and convenience. So far we have had one herd double their test frequency and another move to testing every three weeks – which means we will visit him 16-18 times this year. His plan is to use our service for all of his pregnancy confirmation needs. Combined with pregnancy testing, he plans to use the increased SCC information to make a decision on dry off treatments to see if he can reduce his investment by identifying cows with lower probability of becoming/having an infection. In case you are wondering, this is a 250 cow well managed dairy herd. This is not something that we anticipated, however, this is something that our customer feels is a good fit for his management style. We will be watching to see if more farmers follow his lead.

**SUMMARY**

There are basic marketing stages that each of us will use in our business. However, the importance of knowing your market and proper market preparation cannot be understated. Each product will be different and require special attention to become a success. Don’t forget to consider all the people who will influence the farmers decision as well in this process.
WHAT’S AHEAD IN HERD TEST STANDARDS

Uffe Lauritsen
President, ICAR

DIRECTION FOR HERD TEST
- Recording will continue, but change
- Organizations to develop
- Services above price
- Precision is needed
- Electronic ID (FDX/HDX)
- Added value is the nerve

METERING AND SAMPLING
- No sign of breaking news in technical equipment
- Focus on Carry over
- Challenges in high capacity parlors
- Sample logistic

CENTRAL LAB SERVICES
- PCR
- BHB/acetone
- IBR
- BVD
- Pregnancy check
- Other

ON FARM ANALYZERS
- Examples
- Different systems
- State of the art

USE OF DATA FROM AMS
- Milk flow rates
- Milking speed
- Teat position
- Cross use of data
Dairy Breeding programs from across the world can take credit for widespread improvement of dairy cattle with permanent genetic gains in Milk, Protein & Fat yields along with significant improvement to type and workability traits. Global breeding programs have made a universal difference - all these traits have been improved through the collection and estimation of breeding values using genetic evaluation systems both within and across countries.

Not all the news has been good news however over the last 10 to 20 years, a decline in fertility in dairy cattle has been observed around the world. In Australia the genetic trend of calving interval has deteriorated by +0.5 days per year over the period 1986 to 2001.

In 2013 a new multi-trait fertility ABV will be launched by ADHIS as part of the April ABV proof release that includes the following predictors of 6 week in-calf rate: calving interval, lactation length, days to first service, non-return rate and pregnancy rate. The new multi-trait fertility model has been calculated to increase average first proof bull reliabilities (i.e. on around 80 daughters) from 0.33 to 0.38. The limitation to realising the full potential of this new multi-trait model is the capture of farm fertility and mating data.
FERTILITY DATA COLLECTION HAS BEEN A CHALLENGE
Among cows that calved in 2009 the proportion of cows with mating and pregnancy data was 18% and 13% respectively. The Dairy Futures CRC in conjunction with ADHIS have recently embarked on a co-ordinated effort to capture many more mating and pregnancy records that are electronically recorded on-farm but currently do not contribute to fertility ABVs. The success of this project rests on how much extra phenotypic data is collected; we have estimated that the impact could be as much as increasing the response to selection in 6 week in calf rate by 13% after 10 years of selection.

This is through increasing the reliability and consequently the intensity of selection or proportion of 1st proof bulls selected (i.e. bulls graduating progeny-testing with first crop daughters). The variation or spread in fertility breeding values is also expected to increase, so it will be easier to identify bulls that will breed daughters that have superior fertility. Many high ranking young bulls that have been selected to graduate in the past have done so without publishable ABV's for Daughter Fertility as that information has not yet been gathered in sufficient quantity by Industry and we have forced to wait until second crop daughters are milking to get sufficient numbers of daughters for a reliable proof. In this case, the benefits have been largely lost due to the delay in-time. Collecting all farm data that is stored in farm software programs will give us more data volume and greater accuracy to estimate sire Breeding Values.

WHERE DO WE LOOK TO FIND POCKETS OF FARM DATA?
Our CRC / DPI-V / ADHIS data collection project will look at the major farm software programs in:-

# MISTRO - data transfer with most DPC's is working now

# EASY DAIRY / DAIRY DATA / DAIRY ID - we are testing the manual transfer of fertility & mating data from Farm -----( Dif108 )-----→ DPC to confirm the process will work. Once the fertility & mating data reaches the Herd Test Centre ( DPC ) it is then routinely transferred to ADHIS. Once testing is complete we will look to automate the process with regular transfer of fertility data from farm to the Herd Test Centre then onto ADHIS. Early results have been most encouraging with up to 9 years of farm fertility data with over 9,000 records moved from a single farm to DPC with the click of the on-farm software button.

# VETERINARY HELD FERTILITY DATA - A partner in the project is Warrnambool Veterinary Clinic, who own the popular DairyData software used by many veterinary practices and some farms to closely monitor fertility levels. Pregnancy test data is important because it can be used to calculate pregnancy rates, which are an early and reliable source of fertility data that can be used in a very positive way for estimating fertility breeding values. We have started discussions with other major veterinary groups to look at including their contribution to farm mating & preg check information to go back into the Dif 108 file loop and back to the farmer's Herd Test Centre for upload. We can split the Vet clients data into those herds that are Herd Testing and those herds that are not Herd Testing. We have the challenge for the non Herd Testing herds that the cows are not known to the Milk recording system and have no National Animal ID number allocated at the point of data entry. A challenge to the Herd Improvement Industry as a group is to re-engage with these herds as many of these had previously Herd Recorded but no-longer do so. Many of these are big herds with electronic recording of cow & pedigree data in on-farm software ( ie Dairy Data ) or held on on-farm platform fully automated systems such as Jantec or De Laval. We need to look at the mechanics of re-establishing their cows electronically back onto the National Herd Test system then allocating a National Animal ID number, exporting that unique number back into the farm software then exporting the mating data back to a Herd Test Centre / DPC.

# FULLY AUTOMATED DAIRY PLATFORMS - these high tech platform systems will be also studied to see what current data can be transferred from these dairy systems in a suitable format to the Herd Improvement DPC platforms. These high tech systems are collecting massive amounts of cow and herd data 365 days of the year so it becomes important to see how we can include their data and make full use of their reproductive information.

FERTILITY DATA COLLECTION PROJECT AIMS
The overall aim of the Industry wide project is to provide ADHIS with fertility data (mating and pregnancy test data) from many more herds Australia wide than we do at present. We plan to improve the overall quantity and quality of fertility data in the ADHIS database so that farmers and breeding companies have even better ABVs for fertility.

Another aim of the project is to identify 100 herds with superior fertility data – these Australia wide herds with complete records on calving dates, mating dates and pregnancy testing. These herds will form a base from which each cow in those herds will be genotyped and become a resource of high quality phenotypic and genetic data. The 100 nucleus will
become a genomic reference population to increase the reliability of fertility breeding values further still. Already, the 10,000 cow project and Jernomics have shown the value of cows to the genomic reference population: the contribution of genomic data has been shown to increase the reliability of fertility ABVs of first proof bulls by a further 10%. The collection of extra phenotypic data in addition to genomics is expected to increase the reliability and consequently response to selection in fertility in the Australian dairy herd.

We will do this with the valued support and co-operation from many dairyfarmers and their respective Herd Test centres, veterinarians and on-farm software suppliers that have been very supportive and encouraging to make this happen. Data is king – we need it from all available sources so that the focus of fertility can be further sharpened.
EVALUATION AND BREEDING FOR BODY CONDITION SCORE. IS IT POSSIBLE?

Rohan Butler and Mekonnen Haile Mariam

INTRODUCTION

Body Condition Score (BCS) is a measure commonly used by farmers and service providers to estimate the body energy reserves for individual cows. Many studies have shown that extremes of body condition score can be related with health and fertility difficulties;

Cows that are too thin have:

- Lower peak milk production due to a lack of body energy reserves;
- Increased instances of metabolic disease
- Take longer to resume normal estrus cycles

Cow that are too fat have:

- Increase chances of dystocia (calving difficulties)
- Depression of voluntary dry matter intake in early lactation that predisposes the cow to metabolic issues like ketosis.

As it has been well documented and discussed, over the last 20 years improved management and genetics have resulted in a cow capable of producing large volumes of milk. One of the trade offs for this has been that as shown in figure 1 the stereotypical modern cow enters negative energy deficit in order to reach peak milk production. During this negative energy deficit she struggles with health problems and hormonal imbalances that significantly decrease the chances of her going back in calf.

Figure .1 Affect of days in milk on BCS

Source: Haile-Mariam et al. 2013
EVALUATING BODY CONDITION SCORE
Currently Holstein Australia evaluates body condition score based on the 1-5 point scale developed by Ferguson et al. (1994). The scale allows evaluators to discriminate between animals in units of 0.25. HA has been collecting data on BCS since 1999.

The primary reference point is the amount of fat coverage between the hips and the pins, whether the line of the body between the hips and pins make a “V” or a “U”. A “V” means there is very little body condition and a “U” indicates intermediate coverage. From this point evaluators then look at the amount of coverage in and around the tail head to distinguish heavier animals.

Animals classified under the Holstein Australia classification system are also presented with 1-9 linear value. This linear value is calculated using the 1-5 visual assessment adjusted by age at calving, parity and stage of lactation. This conversion allows farmers to compare animals of different ages and stages of lactation. It also means that two animals with the same body condition can have different linear. For example two cows, one 60 days into lactation the other 250 days in, both score 2.75 for BCS. The cow later in lactation will receive a lower linear as cows later in lactation are expected to have higher BCS than cows approaching their peak milk yield.

Unlike other conformation traits Holstein Australia has not assigned an ideal linear score for body condition. The thinking behind this is that the production system in place on a given farm helps determine the ideal BCS. In other countries, such as Canada, the ideal has been placed at 6. Holstein Australia has also not placed an official weighting on the BCS so it does not contribute to final score.

MANAGEMENT OF BCS
Herd managers have two opportunities to optimise BCS of the cows under their care. Firstly, they are able to alter the diet of cows. The major benefit of this is that the effect is immediate and can be applied to all cows in the herd. The other opportunity is via genetics; it is possible to select and breed for cows with an improved BCS.

The question is how we select animals to use in breeding programs that will result in a next generation of heifers that are genetically and phenotypically superior for BCS. At the moment the answer to that is with some difficulty, because there is not an Australian Breeding Value (ABV) available for this trait. Fortunately at some point in the future we will reach a tipping point where we have enough data to calculate one.

In the meantime it is possible for breeders who are conscious of issues resulting from BCS to select animals using highly correlated traits. A correlation is simply the relationship of one trait to another. For example selection for just increased milk yield will also result in increased protein yield.

Recent work by Haile-Mariam et al. (2013) has reveal that there are several traits with breeding values already being calculated by ADHIS, that are highly correlated with BCS.

Table 1. Genetic correlations and Standard Errors (SE) between Body Condition Score and selected type traits

<table>
<thead>
<tr>
<th>Traits</th>
<th>Correlation</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bone quality</td>
<td>-0.76</td>
<td>±0.04</td>
</tr>
<tr>
<td>Stature</td>
<td>-0.09</td>
<td>±0.04</td>
</tr>
<tr>
<td>Angularity</td>
<td>-0.68</td>
<td>±0.04</td>
</tr>
<tr>
<td>Chest width</td>
<td>0.79</td>
<td>±0.04</td>
</tr>
<tr>
<td>Body depth</td>
<td>0.46</td>
<td>±0.04</td>
</tr>
</tbody>
</table>

Source: Haile-Mariam et al. 2013

The correlations in Table 1 show even though there might not be a direct breeding value to use, there are type traits that are highly genetically correlated with BCS. For animal breeders that wish to make an increase to BCS they can choose bulls that sire daughters with increased chest width and body depth. They can also choose bulls that sire daughters with a slightly rounder bone (lower Bone Quality).
Table 2. Genetic correlations and Standard Errors (SE) between Body Condition Score and selected production and health traits.

<table>
<thead>
<tr>
<th>Traits</th>
<th>Genetic Correlation</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-day milk</td>
<td>-0.2</td>
<td>±0.04</td>
</tr>
<tr>
<td>305-day milk</td>
<td>-0.23</td>
<td>±0.04</td>
</tr>
<tr>
<td>305-day protein</td>
<td>-0.14</td>
<td>±0.05</td>
</tr>
<tr>
<td>305-day fat</td>
<td>-0.17</td>
<td>±0.05</td>
</tr>
<tr>
<td>Lactation length</td>
<td>-0.3</td>
<td>±0.06</td>
</tr>
<tr>
<td>Calving interval</td>
<td>-0.23</td>
<td>±0.06</td>
</tr>
<tr>
<td>Calving to 1st service interval</td>
<td>-0.35</td>
<td>±0.09</td>
</tr>
<tr>
<td>Pregnancy rate</td>
<td>-0.03</td>
<td>±0.13</td>
</tr>
<tr>
<td>1st service non-return rate</td>
<td>-0.14</td>
<td>±0.15</td>
</tr>
<tr>
<td>Survival</td>
<td>0.04</td>
<td>±0.06</td>
</tr>
</tbody>
</table>

Source: Haile-Mariam et al. 2013

As with all selection decisions there is the potential to worsen or slow the rate of gain in other traits of economic importance. Table 2 shows that if we select for increased BCS we will have a reduction in all yield traits. Chest width and body depth are both positively correlated with yield traits, but the negative correlation with bone quality will be the link to reduced milk production. As bone quality decreases, cows tend yield less and maintain more body condition. Selection for chest width and body depth may help lead us to a cow that maintains BCS and yield simultaneously. These two traits are also connected to increased maintenance costs, so we need to be aware of driving up the cost of production. Table 1 notes a -0.09 correlation with stature, this will help to keep the increased liveweight and maintenance cost issue in check.

The major trade off to this is that there is significant benefit in reducing the calving interval. Calving interval is essentially a mix of three things,

- How soon the cow begins estrus and is able to be joined (Calving to 1st service)
- Whether the cow goes in calf or not (1st Service non-return rate)
- Then that pregnancy needs to be maintained (Pregnancy Rate)

It seems that the cows with increased BCS have a reduced calving to first service interval. The genetic correlation with calving to 1st service of -0.35 indicates that higher BCS cows are able to be joined earlier in lactation. While the correlations for pregnancy rate and first service non return rate are not favourable they have high standard errors indicating that further studies could find correlations closer to zero.

**CONCLUSIONS**

A breeding value for BCS is warranted due to its relationship with reduced calving interval. It would allow breeders to select animals for their breeding program that have increased BCS and also reduced calving interval. Unfortunately the Australian data set is not yet large enough to calculate accurate breeding values for individuals. In the mean time there are several traits that breeders can use as a guide when choosing between bulls.

**BIBLIOGRAPHY**


THE NEW MULTI-TREAT FERTILITY MODEL AND ITS IMPACT ON BULL SELECTION

Mekonnen Haile-Mariam1,2, Gert Nieuwhof1,2,3, Kon Konstantinov1,2,3, Phil Bowman1,2, Jennie Pryce1,2
1 Dept. of Primary Industries
2 Dairy Futures CRC
3 ADHIS Pty Ltd

SUMMARY

Due to lack of good quality fertility data on large numbers of cows, genetic evaluation for fertility in Australian dairy cattle is based on calving interval (CI) and days from calving to first service (CFS) interval. In this study the advantages of using additional traits such as lactation length (LL) and mating and pregnancy data were assessed. The genetic correlation of fertility traits such as CFS, first service non-return rate and pregnancy rate with CI was strong. LL was also highly correlated with CI suggesting that it can be used instead of CI for cows that do not calve again. The use of the additional fertility traits and LL increased the reliability of sires' Australian breeding values from 33% (when only CI was used) to 38% (when all traits were used) for sires with 30 or more daughters. The spread of fertility ABVs (known as variation) will also increase, so there will be bigger differences between the best and worst bulls. There is also increased stability between fertility ABV runs showing that an early fertility ABV of bulls based on first crop daughters is more correlated with ABVs calculated based on all daughters. Implementing a multi-trait genetic evaluation could help to improve the reliability of sire ABVs for these traits and thus minimise the ongoing genetic deterioration in fertility traits in Australian dairy cattle. The other advantage of the multi-trait model is the number of bulls with publishable ABV across the breeds will increase by 67% compared to the current model.

INTRODUCTION

Fertility levels in dairy cattle have been declining. Over the last decade both protein yield and calving interval have increased by about 1 kg and 0.5 days per annum respectively, in Australian Holstein cattle. Reversing this decline in fertility is important because the impact of low fertility on profitability is twice as much in seasonal calving herds than in year-round calving herds and over 50% of the national cow population are calving seasonally. Selection for fertility by including it in the total profit index (such as APR) can help to stop the downward genetic trend and assist in achieving compact seasonal calving and breeding patterns.

The reliability of fertility ABVs which is currently based on calving interval and calving to first service interval is quite low. An even bigger issue is that fertility ABVs between consecutive genetic evaluation runs are found to be less stable than expected. The main reason for this is that calving interval (CI) data is often censored. Censoring in this context means that, CI of cows that re-calve late or do not calve again are initially excluded from the ABV calculation. Data of cows that re-calve late may be included in subsequent genetic evaluation runs, so this could be a source of instability between runs. Additionally, data of cows that do not calve at all due to poor fertility is often ignored, and this could result in biased breeding value estimates. So the worst culprits for fertility i.e. the ones that do not get in calf do not get included in the ABV calculation. A multi-trait analysis of CI with other fertility and predictor traits could be used to calculate more accurate fertility breeding values. This is especially valuable for young bulls because first proofs are generally based on low numbers of daughters and are therefore more susceptible to biases introduced by censoring. Furthermore, using additional data that is available earlier, should lead to better fertility breeding values that are available earlier.

The main objective of this work was to develop a multi-trait fertility model that can be used to calculate more reliable and stable ABVs that also incorporates information on partially recorded fertility traits such as mating and pregnancy data to improve the timeliness of ABVs.
Materials and Methods
To identify possible predictors of fertility, ADHIS data that are mainly obtained from milk record schemes were compared to fertility data from herds that recorded several fertility traits. For this both data from herds monitored by University of Melbourne (Faculty of Veterinary Science) and the In-calf project were joined with the ADHIS data and analysed. In addition to calving interval fertility traits such as calving to first service interval (CFS), first service non-return rate (FNRR), pregnancy rate from ADHIS database and 3-week submission rate, 6-week submission rate, 6-week in-calf rate, 21-week in-calf rate from University of Melbourne and In-calf project were analysed. Possible predictor traits tested were survival from current to next lactation, lactation length (LL), milk yield and some type traits and body conditions score. Consistency of genetic relationships among indicator and fertility traits were assessed in Jersey and Holstein breeds using ADHIS data. The data in the Holstein breed were also subdivided into herds that managed short or long calving interval to assess if the importance of indicator traits is consistent in the two groups of herds. Herds with low mean CI were assumed to represent seasonal calving herds where calving in the planned calving period is a key measure of successful reproduction and those with high mean CI were assumed to represent herds that practice extended lactation. Then genetic parameters were estimated for several fertility and indicator traits that could be part of the multi-trait model. ABVs for the main fertility trait, (i.e. CI), from a single trait model were compared to those from multi-trait models that included additional traits using data of different years to assess stability of ABVs in different genetic evaluation runs. For this, ABVs for CI calculated from database in 2007 and 2011 were compared by calculating correlation and regressions. The benefit of jointly analysing CI with other fertility traits and indicator traits were also assessed by calculating empirical reliabilities for bulls from their prediction error variance.

The current threshold for publication of fertility ABVs is 55% reliability and daughters in at least 10 herds. The increase in the number of bulls with a publishable fertility ABV was calculated based on the August 2012 ABV run using only Australian data and conventional breeding values for bulls with first daughter born form 2000 onwards. Correlation between ABVs based on the new multi-trait and the current two-trait model were calculated for these animals.

Results and Discussion
The analyses of fertility data in the closely monitored herds from the University of Melbourne showed that cows which were not mated 6-weeks after the start of the mating period were twice as likely to be culled and not have CI as compared to an average cow. Also cows with poor fertility (i.e. not pregnant by 6- or 21-weeks) had a higher chance of being culled and/or a longer lactation length than cows that were declared pregnant. In the Holstein breed long CI is genetically associated with low survival. This is in contrast to the Jersey breed where long CI and high survival have a positive correlation. The genetic association between CI and survival is stronger (-0.61) in Holstein herds with low mean CI but less strong (-0.24) in Holstein herds with high mean CI (herds that practice extended lactation length). In both breeds and group of herds, the genetic correlation between LL and CI was higher than 0.8 suggesting that LL can be used instead of CI for cows that do not re-calve. Despite a difference of about a month in mean CI between low and high mean CI herds, correlations between CI ABVs for bulls did not show significant genotype by mean herd CI interaction. Also genetic correlations of CI in high and low mean CI herds was effectively 1 when CI in the two group of herds were considered as two different traits and genetic correlation were estimated between them.

Finally a multi-trait model that includes CI, LL calving to first service interval, pregnancy rate and first service non-return rate is found to be the best model for calculating fertility ABVs for all breeds. This is because the genetic correlations of CI with LL, CFS, PR and FNRR were strong; particularly, the genetic and environmental correlations between CI and LL which were both high. The use of LL as a predictor of CI for cows that do not calve again is important because it is available on most cows in the ADHIS database. In the ADHIS database, data on fertility traits that can be derived from mating and pregnancy data is still limited, so genetic evaluation has to rely largely on CI data. However, in recent years both the mating and pregnancy data is increasing. For example, the amount of pregnancy data available has doubled between August 2007 and 2011.

The results of the analyses showed that for bulls with 30 or more progeny with CI data, the ABV reliability for CI increased from an average of 33% when only CI data was used to 38% when CI was analysed with the other 4 fertility and predictor traits. This improvement was mainly due to including lactation length data for cows that did not have CI. The advantage of including the partially recorded fertility traits such as pregnancy and calving to first service was mainly to improve the timing of the ABVs for fertility. Another advantage of using a multi-trait model was that the standard deviation of bull ABVs increases by about 13%, showing that the scope for selection can be increased by multi-trait analyses of CI. The improvement in reliability of ABV of bulls was estimated to have a flow-on effect on the reliability of genomic prediction for fertility of about 2%.
For bulls, with 20 or more progeny with CI in the first parity, the correlation between their ABVs in 2007 and 2011 was 0.97. Selecting the most reliable bulls (i.e. by increasing the number of progeny that bulls have) for calculating correlations between ABVs based on 2007 and 2011 data increased correlation further. For example, when bulls with 400 or more progeny were used the correlation between their ABVs increased to 0.99. In addition to the increase in correlation between ABVs as the number of progeny increased, the ability of ABVs in 2007 to predict ABVs in 2011 also increased. For example, the regression of 2011 ABV on 2007 ABV was 0.95 when ABV of bulls with 20 or more progeny were used and increased to 0.97 when bulls with 50 or more progeny were used. For the most reliable bulls with 400 or more progeny where the correlation between ABVs was 0.99, the regression value was 1.00 suggesting no bias. The genetic trend of bulls over the years based on first parity data was similar to that based on all parity data suggesting that ABVs met the Interbull genetic trend validation test (i.e. less than 0.02*standard deviation of ABVs). Furthermore, analyse by ADHIS has verified that the random variation in CI ABVs of bulls (i.e. Holstein, Jersey and Red breeds) between genetic evaluation runs was within the acceptable range (i.e. the genetic evaluation meets Inter-bull’s genetic trend validation criteria). Correlations between ABVs for consecutive years were 0.99 in Holstein and 0.98 in Jersey.

Implementation of the new fertility ABV model by ADHIS showed that the number of bulls with first daughter born since 2000 with a publishable fertility ABV increased from 1499 to 2506 across all breeds. This is a 67% increase in the number of bulls with publishable ABV for fertility. The average reliability for these 2506 bulls increased from 59% to 67% in Holstein and from 61 to 69% in Jersey, an increase of 8% in both cases. Similar increases were observed in other breeds. The correlation between the current and the new multi-trait fertility ABV was 0.85 in Holstein and 0.79 in Jersey bulls. The addition of new information (i.e. LL, pregnancy rate, first service non-return rate) is the main reason for the low correlations between ABVs. The ABV of bulls that change most compared to the current model were bulls whose daughters were culled before calving again due to poor fertility. This is because in the new fertility model information on culled daughters is included by using LL and by predicting CI for cows that are reported as culled for poor fertility in the ADHIS database.

**IMPLICATIONS**

1. A new fertility ABV model will be launched by ADHIS in April 2013. This is a multi-trait model that includes calving interval, lactation length, interval from calving to first service, pregnancy rate and first service non-return rate will be implemented by ADHIS. Lactation length is a proxy for calving interval for cows that do not calve again. The interval from calving to first service measures the ability of cows to show heat early and first service non-return rate measures the ability of cows to conceive once mated. Pregnancy rate is another measure of ability of cows to conceive.

2. The reliability of bull proofs using the new multi-trait model has increased by at least 5% for first proof bulls and 2% for bulls with genomic breeding values. The spread of fertility ABVs (known as variation) will increase dramatically, so there will be bigger differences between the best and worst bulls. This will also affect the APR of the bulls.

3. The stability of fertility ABVs from one run to the next has increased markedly and meets the Inter-bull genetic trend validation test, further increasing the value of the ABV.

4. The quality and quantity of the mating and pregnancy data that is received by ADHIS and its contribution to improving reliability is limited at this stage. The initiation of the new fertility project is expected to improve the flow of fertility data to ADHIS. This is likely to increase the impact of the multi-trait model.

5. Collection and use of data on traits that can be used to predict fertility such as body condition score could help to improve reliability of ABVs for young bulls in particular in the future.
INTRODUCTION

Each generation entering the workforce upsets the previous one. The new one is arrogant, doesn’t know anything, and has unrealistic expectations in terms of what it can contribute and how it will be appreciated. This is traditional. Our first employers thought the same about us, way back when… The Baby Boomers (born between approximately 1946 and 1964) upset the establishment with short skirts (on females) and long hair with headbands (on both genders); flower power and free love were incomprehensible to their employers. One of the differences between then and now was the fear of unemployment and the stigma of ‘The Dole’ – which meant that Baby Boomers towed the line quite quickly. This is in marked contrast to Y-generation people (born between approximately 1978 and 1994 but sometimes considered to be 1982 and 2000) who grew up through a period of very high employment; they also know that the Government or their parents will support them if they are not working – and even if they are. The Pew Research Center (US) reports that 19% of 18-34 year olds regularly receive financial assistance from parents. Similarly, American Community Survey data (2010) indicates that almost 22% of 25-34 year olds live with their parents. At the same age only 11% of Baby Boomers lived at home. This support means that if members of the Y-generation don’t feel valued and happy in the workplace, they will leave. Although the job market is not as open as it was before the Global Financial Crisis, they still have options, including not working.

The Y-generation is a phenomenon sown and nurtured by the Baby Boomers. Employers of all generations are reaping the consequences of the upbringing and schooling we’ve given them. The phenomenon is already the subject of research and anybody not reading the literature will lose employees. Becoming the employer of choice will take effort, but the rewards will be in having a vibrant, motivated and productive workforce.

GENERATIONS

The Baby Boomers have started to retire. By 2020, McCrindle Research suggests that they will form only 11% of the workforce. In the workplace Baby Boomers want freedom of choice and expression. Leadership must be informed by knowledge, information and logic. Members do not respond well to the command and control leadership style that worked with the Silent Generation (born 1925-1945 and heavily influenced by The Depression and Second World War).

Generation X members were born between 1965 and 1982. They will form approximately 37% of the workforce by 2020, and want independence and flexibility in their employment. They are influenced by perception rather than facts, don’t value authority or experts, and want leadership from within the team.

Generation Y will be 42% of the workforce by 2020. Members of this group are skeptical of power, want to be their own boss (within the security of an income stream from employer, parents, or government) and value freedom and lifestyle. They are being followed by the Z-generation (z for zappers) which by 2020 will make up 10% of the workforce. Because the significant factors in parenting and schooling which have influenced the attitudes of the Y-generation have not been changed, it is likely that the attitudes to ‘power’ and ‘employment’ will be similar in the Z-generation, although their world view (and consequently their attitudes towards environmentalism and employment security) will be influenced by climate change and the Global Financial Crisis. This group regards security of employment rather more seriously than the Y-generation members.

Y-GENERATION

Much of what has been written about the Y-generation reflects generalisations. Of course there are people in the workforce younger than 35 who aren’t typical of their generation (and many of the atypical ones are from rural backgrounds) – but the very fact that so much is being written about this new group does indicate a change is required in attitude by employers. The following is presented in an effort to help employers understand why they are as they are, and how we can adapt.
Generation Y members are confident and relaxed, with a high perception of self-worth. The typical baby boomer parents in developed countries were relatively affluent and have brought their children up with more involvement and affection than previous generations were able to show, frequently treating them as equals. Parents have encouraged and listened to opinions, in marked contrast to the ‘children should be seen and not heard’ attitude of previous generations. This high level of parenting and building of confidence, in an era of tolerance, has resulted in what has been described as ‘a generation of narcissists’ with self-inflated views: they have their own web sites so that other people can find out more about them. San Diego State University psychology professor Jean Twenge has reported a 30% increase since 1982 in students recording above average scores in an evaluation termed the Narcissistic Personality Inventory: by 2006 two thirds of the students had above-average scores.

As children, the younger generations have had five times as many toys as the Baby Boomers, and over 50% of these toys ‘turn on’. This has had an effect on their familiarity with technology, but is a factor in decreasing imagination and creativity. Of further significance, is that when something breaks, it has been replaced (at least in affluent families) which has implications for how machinery is treated on farm.

At school Y-generation students have been given leadership opportunities (over half of them now believe that they are leaders) and high grades (in the US, 43% of grades given are As). They have also been encouraged to evaluate and challenge other people’s ideas and decisions. They are inclined to argue if they don’t like what is being said or done. This has resulted in an education system with more focus on ‘teaching to the exam’, mastery tests where students can have repeated attempts at ‘passing’, multi-choice and internal assessment – so that teachers can justify the assessment. In New Zealand research has shown that this style of education has suppressed motivation. Of further note, Peter Sheahan, Y-generation member and guru, has pointed out that Y-generation members were brought up watching television that ‘convinces them to be as loud, contrary and obnoxious as possible. It says look after number one because nobody else will’. This is despite the fact that Generation Y is the most parented generation ever – looked after to such an extent by parents, chaperones and in after-school programmes that, according to research from Massey University’s Human Resource Management Department, members have had very little unplanned free-time (with detrimental consequences on abilities in creativity and initiative). ‘Helicopter parents’ have been helping to ensure that the route is obstacle free; ‘curling parents’ have ensured a smooth passage. When something goes wrong, they look for the undo button or somebody to blame.

Another contrast in this generation is that having seen the cost of materialism and consumerism on their parents (broken marriages and an epidemic of stress-related illnesses), they say that they are more interested in life than money. They are, however, the most materially endowed and entertained generation ever, and research by Robert Half International (2008) shows that they put ‘Salary’ number one in the list of wants, followed by ‘benefits’:

<table>
<thead>
<tr>
<th>Consideration</th>
<th>Score (out of 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary</td>
<td>9.05</td>
</tr>
<tr>
<td>Benefits</td>
<td>8.86</td>
</tr>
<tr>
<td>Career growth</td>
<td>8.74</td>
</tr>
<tr>
<td>Location</td>
<td>8.44</td>
</tr>
<tr>
<td>Leadership</td>
<td>7.95</td>
</tr>
<tr>
<td>Brand</td>
<td>7.56</td>
</tr>
<tr>
<td>Job title</td>
<td>7.19</td>
</tr>
</tbody>
</table>

A report released by Robert Half in 2012 indicated that post Global Financial Crisis all generations rank salary, benefits and job stability most highly in job consideration. Generation Y also wanted opportunities for advancement and an important job title.

**In the workplace**

Generation Y members expect to be treated as equals, to have choices in what they do, and have input into decision-making. They want to be rich and successful, but know that they should not have to ‘bust a gut’ to achieve their needs. They believe that they are entitled to big money for turning up in the workplace – and extra rewards for doing a good job.

Hudson research indicates that both Baby Boomers and Generation Y have a strong work ethic, but Peter Sheahan points out that there is a 30 hour per week difference in what that work ethic means to them. This may be because the Y-generation members were forming their world view during the 90s when their parents were being urged to ‘work smarter not harder’. The urging was supposed to stop Baby Boomers working even longer hours. Generation Y members, who, in Peter Sheahan’s words, are manipulative, and will twist and distort information to get what they want, exploiting any loophole they can, work smarter so that they can go home early, having ticked all the boxes (or at least enough ‘for a pass’) on their job list.
The following explains the major differences in work attitude between traditional and new employees (McCrindle Research 2008):

<table>
<thead>
<tr>
<th>Traditional Employers</th>
<th>New Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work ethic – live to work</td>
<td>Work-life balance – work to live</td>
</tr>
<tr>
<td>Task focus</td>
<td>Team focus</td>
</tr>
<tr>
<td>Commitment</td>
<td>Enjoyment</td>
</tr>
<tr>
<td>Authority</td>
<td>Empowerment</td>
</tr>
<tr>
<td>Independence</td>
<td>Support</td>
</tr>
<tr>
<td>Structure</td>
<td>Flexibility</td>
</tr>
<tr>
<td>Tell them</td>
<td>Involve us</td>
</tr>
<tr>
<td>Conformity</td>
<td>Creativity</td>
</tr>
<tr>
<td>Tradition</td>
<td>Innovation</td>
</tr>
<tr>
<td>Regional</td>
<td>Global</td>
</tr>
<tr>
<td>Long careers</td>
<td>Many jobs</td>
</tr>
<tr>
<td>Learn then earn</td>
<td>Lifelong learning</td>
</tr>
<tr>
<td>Loyalty</td>
<td>Variety</td>
</tr>
</tbody>
</table>

Of yet further concern is that underperformance (linked to what has been termed in the US as ‘vacuous over-praise’) has increased, and motivation to learn, ability to work in teams, and showing initiative are already being reported as problems in the workplace in New Zealand. This is thought to be linked to that fact that through school they have been rewarded for participation not achievement.

Y-generation members take pride in being able to multi-task (e.g., texting while doing homework and watching the television...), but research from Britain has indicated a decrease in IQ equivalent to 10 points with every extra task in the mind. Furthermore, the need for constant change means that attention to detail, persistence and determination may be absent – research from The University of Utah reports that multi-taskers are easily distracted and can’t focus on important tasks.

But..... They are the workforce of the future. They are young, fresh, energetic and technologically literate. They are prepared to take risks (particularly with technology) and will find efficient ways of doing things (the working ‘smarter not harder’ approach); they will bring new approaches to old tasks. They are important for the future of your business and of the World. Employers with a traditional perspective can learn new approaches to work with the younger generations, at the same time as the younger generation learn to be a valuable member of the workforce.

**Learning for the Y and Z**

Generation Y has been in formal education for longer than any previous group. Members recognise that it is essential to keep skills up to date and the biggest need. Ninety per cent of Generation Ys who receive regular training from their employer are motivated to stay with that employer. This reflects the fact that generation Y is focussed on career as well as personal development, and is motivated by personal fulfillment: this means that employers will need to provide reward programmes linked to personal growth and acquisition of skills rather than just salary in order to retain staff.

In general terms the Y-generation members tend to be holistic learners and so want the big picture rather than detail. They are likely to respond to a problem with emotion first, instead of logic, and they don’t think that they need to understand how something works in order to use it. Furthermore, they want to be seen to be in control - they want to drive the tractor with the feed out wagon and will play with the computer system to make it work... they do not want a lecture from the employer on how to operate the machinery. Of further consideration is the fact that they are motivated by technology, have a low threshold for boredom, prefer pictures rather than words, have a short attention span, and do not regard remembering things as an important part of life. Tasks should be interactive and customised to suit them as individuals – this fits with their concept of importance... and the boss being involved with their learning is ideal. The boss is effectively *loco parentis*, and they are used to parental interest.
Employer support for training programmes is becoming the expectation. This will certainly mean time off to do the course, and may mean paying at least part of the fees (after the course has been successfully completed). A first step may be in giving employees time to go to meetings of a local professional group (as long as there is something more than beer on the agenda) – and suggesting to the group that they run some professional development sessions could be a way of ensuring your young employee not only has that professional development, but also interacts with other young people, thereby settling them in the rural community. Also consider supporting them to go to Farm Walks, Monitor Farms, field days, and farmer-focussed conferences. Discuss with them what they have gained from the experience and what they think could have been done better (the farm enterprise or the event organisation). For the really motivated employee, are there any formal tertiary programmes that are suitable? Remember that getting through the study will require support from you – in the place of the parent, asking how the work is going, and about assignment completion, will be an important part of successful completion.

**Communication**

Communication is vital for the Y-generation. Research from Auckland University indicates that 28% of the Y-generation spend more than 3 hours a day texting friends. This has implications in the work place – the young don’t realise how it impacts on their performance in terms of both time and quality of work (remember the drop in effective IQ with multi-tasking). Setting parameters on when texts can and can’t be sent is important. Social networking is a fact of life for this group, so banning texting is not likely to result in a happy worker – negotiate and explain. Also listen to the reasons why a message might be needed. At school they have been surrounded by like-minded people; after school they have been supervised in activities. They might feel lost on their own, and texting gives them a sense of community and support. How much of this can you replace?

As part of communication, describe the job description fully in advance, itemise the tasks for the day, and give clear standards for completion. Also explain the implications when something goes wrong. This is a fundamental requirement – the Y-generation members have grown up with unit standards, templates and tick-the-box answers. They don’t tend to look for extra tasks, do regard two out of three as a good pass, and will interpret the knock-off time literally. Communication on what you expect from them is vital – otherwise they will work smarter… ‘Failing to meet the unspoken expectations’ rates as the hardest thing for the managers in managing their people, and this is exacerbated in the Y-gen. The Y-Generation must be spoken to and the unspoken expectations must be made clear. Add to this the fact that many have not grown up in a rural family, and the reason for clarity is apparent.

**Management and leadership**

Sheahan identifies motivators for Generation Y employees as culture, team, management style, flexibility, conditions, and salary. The key is inclusion. MCrindle Research reported that 97% of the generation Y members surveyed valued a leadership style that involved empowerment, consultation and partnership (and would leave if they did not get it). Similarly, Robert Half International (2008) puts working with good people at the top of the list, followed by work-life balance.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Score (out of 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working with good manager</td>
<td>8.74</td>
</tr>
<tr>
<td>Fun people</td>
<td>8.69</td>
</tr>
<tr>
<td>Work-life balance</td>
<td>8.63</td>
</tr>
<tr>
<td>Short commute</td>
<td>7.55</td>
</tr>
<tr>
<td>Green company</td>
<td>7.42</td>
</tr>
<tr>
<td>Nice office</td>
<td>7.14</td>
</tr>
<tr>
<td>Technology</td>
<td>6.89</td>
</tr>
</tbody>
</table>

Research by Massey University reported (2007) that common features in top workplaces include excellence in leadership, focus on performance and results (including performance-based rewards, recognition systems and formal management structures), allowing employees to feel they are making a difference, and ensuring that they are acknowledged for their contribution.

Generation Y members need constant stimulation, reassurance and praise in order to perform. An Australian workplace survey reported in the media in May 2006 indicated that two-thirds of Generation Y employees believe that they don’t receive enough attention in the workplace. (In contrast, two thirds of baby boomers think that the Y-generation receives rather more than deserved.)
For the new generations, coaching will be very important in the workforce as a way of achieving performance. Coaches listen, support, encourage and give positive feedback, serving as a guide, but encouraging the employees to direct their own progress. Employers must learn to ask open-ended questions and offer information to clarify a situation, helping the employee to identify possible actions, e.g. “What do you think we need to/could do? What options do we have? What if we did...?” Inclusive approaches to problem-solving have been used by their parents, and they expect it with their boss.

Regular informal and meaningful feedback is another requirement. Lester Levy, the Chief Executive of the Auckland University-based Leadership Institute Excelerator, terms this transformational leadership – where bosses treat people “like hearts and souls rather than heads and hands”. Regular informal and meaningful feedback is associated with a nearly 40% increase in performance and a 20% increase in discretionary effort. In contrast, transactional leadership, which is common in Australasia, focuses on goals and objectives and tells employees when something has gone well or wrong. It results in disengagement, which does not lead to a happy or productive workforce. There is a negative impact of almost 30% in people who have their weaknesses highlighted in an annual performance review.

Regular informal and meaningful feedback is associated with a nearly 40% increase in performance and a 20% increase in discretionary effort.

In contrast, transactional leadership, which is common in Australasia, focuses on goals and objectives and tells employees when something has gone well or wrong. It results in disengagement, which does not lead to a happy or productive workforce. There is a negative impact of almost 30% in people who have their weaknesses highlighted in an annual performance review.

Consider having a Friday night review of the week with beer – what went well, what could have gone better, and what are the goals for next week? Let your staff talk and give their ideas. If something went really well, show them how it contributed to performance and then consider a double pass for the movies, or a voucher for a local restaurant.

A management system such as this does involve time and money – but then so does finding a replacement worker. As a staff member winds up employment, productivity decreases. Advertising and interviewing is expensive in time as well as money, and then there is the ‘getting on feet’ period of the new staff member. Costs in staff replacement are estimated (Unisys) to be 150% of annual salary of the person being replaced. Phil O’Reilly, Business NZ chief executive, has suggested that cost is even higher than Unisys’ estimate because as well as the cost of recruiting and induction, there is a loss of productivity as the new employee got up to speed with a new job.

From this it is clear that the key to staff retention is the employer…a keynote paper given by Martin Thorley (Merston Peters Ltd, a recruitment/Human resource management company) at the Oxford Farming Conference this year made it clear:

- Work on the quality of your management; become world class
- Be flexible on how you attract and reward people; show that you care
- Be prepared to invest in success through training and development

Thorley warned that there is a talent shortage that is getting worse, competition is getting stronger for good people, and that the best people are wanted by everybody – they have choices. He also warned that “Growing new people is a long term strategy”.

In addition, Robert Half research suggests that in recruiting people, emphasise the competitive salary being offered, plus the benefits, stability of your operation, and its reputation. Support the employees’ professional goals and create opportunities for training and career development. Do salary reviews regularly (Perhaps more than annually) and award bonuses when you can.

CONCLUSIONS

Allowing employees to feel they are making a difference, and ensuring that they are acknowledged for their contribution is extremely important with this generation. Generation-Y has been likened to Generation-X on fast-forward with self-esteem on steroids; spending time with them is vital for development and retention. Remember that members of the Y-generations are used to their parents hovering and are more comfortable with ongoing access to somebody interested in their personal development than ‘going it alone’.

Generation Y wants only what previous generations have desired. The Generation Y members are proving far more adept at getting it, and so could be considered to be deserving of admiration. The benefits, ultimately, will be for the employer and for the economy.

Rural employers must also ensure that they have the six dimensions of high-performance work systems: a fair promotion process, few status differences, accurate performance appraisals, regular constructive feedback on performance, information sharing, inclusion in decision-making. Creating such a system has been reported to lift job satisfaction, commitment, trust in leadership, and ultimately performance, for the business.

In an economic uncertainty, which applies to agriculture all the time, past history shows that benefits exist for employers prepared to invest in good people. Underperforming companies die, there is release of capital from fading sectors to new industries, and there is movement of high-quality skilled workers toward stronger employers. Making sure that the movement is in your direction means building your reputation as a great employer – and so becoming the employer of choice.
Perhaps of most importance with the new generations is inspirational leadership that creates a shared vision. In an ongoing project surveying tens of thousands of workers globally, over 70% of respondents want forward-thinking in their leaders, and this forward thinking must reflect the aspirations of the workers – they want to know how their dreams will come true and their hopes fulfilled. This suggests that the best way to lead is to connect with the followers in the present; the visions that will take hold are those that are shared. Sharing results in engagement, and an engaged workforce is productive, reflecting positively in the bottom line. The human resource challenge in the agricultural industry can be met by intelligent people observing the human condition: the fundamental need to be creative and be valued.

- **Work-life balance**: negotiate their time priorities and explain the implications
- **Workplace culture**: a fun team atmosphere
- **Varied job role**: ensure that the days aren’t spent hoeing thistles; give responsibility with support
- **Management style**: communicate, listen, listen, check up and then communicate; feedback that is praise and more
- **Training**: have regular goals

Creating the workplace of choice for the younger generations will benefit all generations from all cultures. It means developing a creative and personal work environment where employees are treated and developed as individuals. The cost of backing off on accountability while increasing coaching efforts will be more than covered by increased productivity.
INTRODUCTION

I like to think of the current proposals being made in the US not as a monumental change, but rather, another chapter in our history of dairy cattle breeding. A history that is full of the intertwining of science, a cooperation spirit, good business sense and above all a desire to improve both our management practices and the genetics of our animals. Genetic improvement of one's stock is a long sought after goal of farmers. And one of the most powerful tools, to determine the genetic merit of an animal, is via a progeny test. The scientist, J.L. Lush, in his 1938 book *Animal Breeding Plans*, states that “offspring show what kind of inheritance it really has and will transmit”. You could say Dr. Lush professes this to be a self-evident truth. Leading off his chapter on progeny testing, is a quote from the ancient Roman Varro, proclaiming that you can judge the quality of a sire from his get.

Although the science of genetic evaluations continues to evolve and improve over time, the basic concept or formula has been known for some time. In 1931, Dr. Sewall Wright wrote an article entitled “On the Evaluation of Dairy Sires”. In it he discusses that a proper sire evaluation must consider the quality of a bull’s mate; differences in number of offspring per bull; level of management between herds; and relationship amongst animals.

But, knowing how to do something and getting it done are not one in the same. Dr. Victor Rice, in the third edition of his 1926 book *Breeding and Improvement of Farm Animals*, says “one thing is certain we need to prove more bulls”… however…”the method is expensive”. He made an early call for a cooperative spirit amongst the breeders. By pooling resources, individual costs would be lower, and benefits would be shared by all.

These early scientists were engaging, interacting with our industry, and coaxing breeders to do more. These scientists were, by all sense of the word, leaders. And one of the most influential amongst them was J.L. Lush. He wrote a whole chapter on Bull Associations or Bull Circles, in which he says…”the primary object of a bull circle is to get bull service at lower cost or better bull service at the same cost”. He encouraged the use of DHIA services…”Naturally the members of the bull circle will need to be members of a cow testing association”. He was a cheerleader…”the bull-circle plan may also assist in a less tangible way through the development of community spirit and cooperation.” And he reminded us of the benefits of working together… “Nearly all of the breed associations include improvement of the breed in their very first statements of the objectives of their association.” Scientists working with the industry, bull associations providing better genetics, dairy record providers offering cow testing services, and breed associations promoting breed improvement, does this describe the 1930’s or 2013? I believe the answer is both.

CHALLENGES OF THE MODERN ERA OF ANIMAL BREEDING

Today’s animal breeding ventures continues to contain a strong cooperative element. However, the nature of these relationships has evolved. Throughout the latter part of the 20th century, progeny testing was a well organized and expensive proposition. The success of proven bulls meant that farmers needed some “incentives” to encourage the wide scale distribution and use of young sires. These incentives included assisting with the payment for DH milk recording services and type classification. This cooperative venture has been the main driver of genetic improvement. A benefit shared throughout the industry, by both the contributors of the data and by those who had contributed nothing. This inequity between data contributions and “freeloaders” has become more of a concern in the genomics era. As incentives offered in the progeny testing era may not be available in the genomics era.

A major venture, started in 1999, amongst seven major AI companies was the establishment of Cooperative Dairy bull DNA Repository (CDDR). This resource of DNA, tied to a highly reliable genetic evaluation, was a critical component necessary for the implementation of genomic selection. A research and development agreement with USDA gave the members of the CDDR the exclusive rights to genomic test males for a five year period. This agreement created a lot ill will and mistrust between certain sectors of the industry and the AI companies.
Breeding goals have become more complex over the years with the addition of more traits regarding conformation, health, reproduction, calving ease, survival, etc. In addition to wanting more data, the industry also wanted it quicker and more often. Many of these added tasks fell upon the dairy records processing centers. These centers often felt that the compensation for these extra services was less than the value of the extra data and the extra work. Their lack of representation on the industry’s board of directors for the Council on Dairy Cattle Breeding (CDCB) provided a source of friction that needs to be resolved for a smooth running genetic evaluation program.

Our modern information age allows us quicker and more extensive access to all sorts of data. In the right hands, access to sensitive health and disease data can be quite beneficial to the industry at large. However, in the wrong hands, it can lead to problems for the very dairy farmers who voluntarily submitted that data. A government controlled public database provides limited protection from a freedom of information access request. Privacy and confidentiality are important principles in protecting the source of our data.

Until 2007, the U.S. dairy genetics industry world revolved upon voluntarily supplied phenotypic data and what would become known as traditional genetic evaluations. We relied upon gentlemen’s agreement and memorandums of understanding which many lawyers would now chuckle at. Major genetic issues were discussed and resolved at our biannual CDCB open meetings. The CDCB board makeup had been stable for many years as no new entities had expressed interest in becoming full fledge members. Our world was about to change.

**GENOMICS: A GAME CHANGER**

Whole genome selection, BovineSNP50, genomic predictions, reference populations, and many other new terms became a normal part of our lexicon. We started to discuss different strategies for applying genome-wide selection. We saw new and exciting possibilities. A renewed energy and vitality in animal genetics was evident throughout the industry. We all started asking more and more questions. How could we best use these new technologies? Am I seeing the big picture? Is my organization well positioned to adopt and benefit from genomics? Will our traditional data sources decline? How will I get access to new trait information? As one of our industry leaders put it “it’s one of the scariest times in modern dairy management and breeding”.

Official genomic predictions became available in January 2009. In October 2009, CDCB formed a subcommittee known as the Dairy Data Working Group to “assure that high quality genetic evaluations for the U.S. dairy industry will be available well into the future”. Three and a half years later we’re still working on it. The devil is in the details. But progress has been made.

**MISSION, MARGINS AND PROGRESS:**

Today’s leaders have the same mission as those in the 1930’s; better cows; more efficiency; better farm management; and helping to ensure the profitability of its members. However, long term success of any organization relies on them delivering on their mission while generating the margins to be sustainable. Organizational leaders have a responsibility to its member to do due diligence before making a large structural change to its industry.

The Council on Dairy Cattle Breeding has put forth a proposed business plan for a public-private venture with USDA. The CDCB will take on the service commitment of the genetic evaluations and USDA will concentrate on research. Issues involving governance, capitalization, assurance of operational success and open access to breeders have largely been agreed upon. Here are some of the key points:

- The Cooperative Agreement between USDA-ARS (Agriculture Research Service) and the CDCB has been made available for a public review and comment period. Comments received are being reviewed and will be taken into consideration before signing.
- The CDCB Board of Directors will be expanded to 12 directors, the new directors will represent the Dairy Records Processing Centers.
- Up to two (2) allied industry (non-voting) will be available.
- Release and use of data will be governed by the Material License Agreement between each data provider and the CDCB.
- Capitalization of the CDCB will be provided as a low interest loan and paid back to its members.
- Operational income will come from genomic testing fees of individual animals and AI service fees. Approximately 80% of the fees will come from the genomic testing of males and 20% from females.
- A nominal one time fee will be charged for genomic tests for females with a varying amount for full-data contributor, member of a CDCB organizations; domestic non-member; and foreign non-member.
- An initial fee will be charged for genomic testing of males with an additional charge for those bulls entering AI service.
- A validation and certification process will be offered to allied organizations desiring to become a nominator or submitters of genomic tests.
The USDA-ARS has publicly supported the idea of a public-private venture with the CDCB. The new agreement will clarify ownership and control of the data used in the national genetic evaluations. That is, access and permission to use parts or all of the national genetic evaluation dataset is governed by the members of the CDCB. The genetic evaluations will continue to be done in Beltsville, MD. Office space, within the USDA facility, has been offered to the CDCB staff. Access to equipment and USDA personnel will continue for 2 years helping to ensure a smooth transition. However, USDA researchers will have more time to spend on research, bringing them more in line with the mission of the Agricultural Research Service and less likely to be a target of any future Federal Government budget cuts.

**TIME FOR ACTION:**
The U.S. dairy genetics industry recognizes the changing landscape of animal breeding. It wants more control of its data, more input in determining the genetic evaluation services that will be provided, and establishing more fairness in distributing costs amongst the data providers and non-data providers. And it believes it’s up to the challenge.

USDA-ARS is looking to the U.S. dairy genetics industry to become more self reliant. Take on the service components of genomic calculations and fulfill the future service needs of its industry. They want the industry to provide direct input and make more decisions on the future of the genetic evaluation program. USDA scientists will still be interacting with the industry, they’ll still engage us by showing us their new discoveries and offering guidance on its applicability. They’ll be coaxing us along. Why, I’m starting to think they’re acting like a modern day J.L.Lush.
The poor Holstein cow. She has done so much good for the world yet is blamed for so much that is bad. She has been blamed for everything from global warming, to threatening cultural traditions, causing the demise of local breeds, and of course the causing the ruination of fertility. I hope to put some of this in to perspective and show some reasons for optimism that we have reversed this fertility trend and that a lot of our blame was simply misplaced and should have been directed at human managers not our dear sweet black and white bovine who was described by W. D. Hoard described as “the foster-mother of the human race”.

Many papers and studies have been done the past ten years about the precipitous decline in fertility rates of Holstein cows. Often these studies showed the negative correlation between increased milk production and decreased fertility rates. In my opinion we have demonized the amazing story of progress. We created a dairy machine we did not know how to drive. In 1942 the United States had more than 25 million dairy cows producing 118 million pounds of milk. By 2011 the United States dairy cow population had dropped to 9.1 million cows yet the milk production from 15.9 million less cows was 196 million pounds. 78 million more pounds of milk from 63% less cows. If we really think cows are indeed contributing to climate change, 66% more milk from 63% less cows is a huge leap of efficiency, a reduced global footprint and a lot less methane floating around the atmosphere.

With a growing world population and rising demand for protein in the diets of growing populations in Asia, Africa and Latin America and increased demands for water and land resources, we can’t turn back the clock to a simpler time when life was slower and breeding cows was easy. The price of this milk production increase was reduced fertility in the minds of many and in multiple research papers and studies. Most of the solutions centered around changing breeds, cross-breeding and or selecting against higher milk production in genetic selection. All potential solutions but at best they were strategic solutions to an immediate problem and would take years to have an effect.

With almost religious zeal people preached their doctrine for change often without looking at the whole picture or listening to the view of others. Like many problems there were lots of causes and fixing the problem would take a multi-prong approach. One of the first steps was understanding the real root causes of the problem. In the United States at the same time milk production was rising so was average herd size. By 2007 nearly 50% of the cows were in herds more than 500 cows with many of these herds 5000 cows or larger. This growth in herd size also meant more of the work on dairies performed by non-family labor. Much of this labor was Spanish speaking which created communication barriers that most herd-owners and herd-managers had never dealt with before. In the early days of this massive herd expansion the strategy was to just do the things you had always done but just do more of it.

Reproduction is always the first thing to suffer. The canary in the coal mine and for a time it seemed like our bird was going to die. We had created a powerful genetic machine that had tremendous milk production capability but also required a different kind of care and handling then the lower producing cow of the past. It was obvious that there was a gap between the management needs of larger herds with higher producing cows and the management abilities of most herd-owners and herd-managers.

One of the arguments by some in the industry at the time was that we had not substantially changed the Holstein’s physiological ability to reproduce. Evidence of this was that the fertility rate of virgin heifers had been fairly steady over the same time period that cow fertility was declining. This suggested that it was the stress we were putting on cows not changes to their physiology that was causing this fertility decline. It led us to understand that instead of looking just at the inside of the animal to solve this issue we needed to focus more at the environment, processes and procedures operating around the cow.

One big challenge that affected both milk production and reproduction was nutrition. It took many years and a joint industry effort to implement ideas like TMRs, body condition scoring, controlling acidosis, the role of fiber, MUNs, transition cow rations utilizing herd-management software dairy metrics and providing consistency in rations.

On the management side people and processes were more often to blame than the cow herself. Consultants in the US dairy industry spent over a decade and a half teaching and preaching standard operating procedures, reducing variation, quality control, communication skills, cultural differences and team building. Cow comfort also took on
industry-wide importance as we focused on stall design, ventilation, heat abatement, cattle handling, maternity pen management, stocking density, feed bunk space, access to water and other things designed to minimize stress on the animal. These management changes along with industry wide reproductive education programs and tools such as estrus synchronization, systematic heat detection programs and the increased use of activity monitoring systems for heat detection have caused a reversal of the fertility trend.

The main metric used to measure fertility in US dairy herds is pregnancy rate (PR). PR combines estrus detection rate (EDR) with conception rate during a 21-day period. Thus PR can be improved by changing EDR and or conception rate. EDR had suffered the most during this period due to increased herd size, lack of systematic programs and shorter, less active heat periods from high producing cows. In 2005 PR were around 13%. By 2013 that had improved to 17% with many herds 25% or higher. Most herds achieve more than enough pregnancies to maintain profitable herd size at around 20% PR.

On the genetics front too progress has been made. Increased selection for fertility traits is now showing in sire summary data. The selection of sires using traits like daughter pregnancy rate is now showing up in the population giving us optimism that we are on the right track to improving fertility.
Inseminating cattle with sex sorted semen: Placement and timing

Scott Norman (BVSc, PhD, DACT, MANZCVSc, GCEd)
Associate Professor in Theriogenology

Introduction
Until the mid 1980's artificial insemination recommendations were to deposit two thirds of the semen dose into the uterine body and one third into the cervix. Subsequently it has been recognised that very few sperm deposited within the cervix are able to make their way to the fertilisation site in the uterine tube. Therefore, since the mid 1980's the general recommendation for semen deposition is to place the complete dose within the uterine body, and this practice has generally served the industry well. Yet, given the absolute dependence that the dairy industry has on high fertility, it is incredible the lack of specific and recent information available on the placement and timing of insemination. Much of the insemination timing recommendations are based on a study performed more than 60 years ago, prior to the use of frozen - thawed semen (Trimberger, 1948). While insemination placement recommendations are based on studies from the 1940s through to the 1980s, prior to the advent of sex-sorted semen. With the more widespread use of sex-sorted semen, it is timely to revisit recommendations for semen deposition, particularly with the knowledge that the major preovulatory sperm reservoir appears to be at the utero-tubal junction. This review provides an update on the ideal site for semen deposition with specific reference to the use of sex-sorted semen, with comment also on insemination timing.

The fate of sperm after insemination
After natural service, the bull deposits well over 1 billion sperm into the anterior vagina. However, the cervix is a major obstacle to sperm transport, and only approximately 1% (100 to 300 million) of the inseminated sperm make it to the body of the uterus (Hafez and Hafez, 2000). Sperm are progressively lost as a result of phagocytosis and retrograde loss during transit through the uterus, with only a small population making it to the site of fertilisation within the uterine tube. One of the reasons that artificial insemination doses can be significantly reduced (generally around 10 million sperm) is that the sperm are deposited directly into the uterine body, by-passing the cervical barrier. Figure 1 summarises the fate of sperm after natural service.

Figure 1 - The fate of sperm after natural service (Senger, 2003).
The site of insemination – relevant physiology, anatomy and a brief history

Once ovulation occurs, the oocyte has a lifespan of approximately 6 hours. Fertilisation occurs within the uterine tube (oviduct), and fresh spermatozoa must undergo a process of capacitation before they are capable of fertilisation. The capacitation process also takes approximately 6 hours. Processed semen such as frozen semen, or sex-sorted semen has undergone changes similar to the capacitation process and takes less time after insemination to be capable of fertilisation. The anatomy of the bovine reproductive tract is shown in Figure 2.

Figure 2 - Anatomy of the reproductive tract of the cow (Senger, 2003).

With the advent of commercial-scale artificial insemination, cows were initially inseminated into the cervix with the aid of a vaginal speculum. For many years, the cervix had been considered to be the main reservoir for spermatozoa prior to ovulation (Mattner, 1966). However, there is no evidence that spermatozoa held within the cervical folds are any better at achieving fertilisation than spermatozoa held in the caudal uterine tube (Hunter, 2003). To the contrary, spermatozoa deposited within the cervix are less likely to achieve fertilisation compared to those placed in the uterus (Hawk, 1983). The idea that the uterine tube may be the main site for the preovulatory sperm reservoir became established in the 1980s (Hawk, 1987). This area is represented graphically in Figure 1, item 4.

In the 1940's, prior to this knowledge of sperm reservoir function, but with the development of suitable pipettes and rectal manipulation skills, cervical insemination was replaced with trans-cervical intrauterine AI, but leaving approximately one third of the insemination dose in the cervix as a purportedly “slow release” reservoir. Then, based on the assumption of higher fertility the closer semen is deposited to the site of fertilisation, deep horn insemination was trialled from the 1950's (Knight et al., 1951; Olds et al., 1953; Salisbury and Vandemark, 1951; Weeth and Herman, 1951). These studies failed to demonstrate any difference in fertility between the different sites of semen deposition. But importantly, all of these early studies involved the use of fresh semen containing large numbers of spermatozoa. The point being that the use of large numbers of spermatozoa and fresh semen (ie, top quality semen) could readily mask any beneficial effect of depositing semen deeper into the uterine horn.

It has been definitively demonstrated that deposition of either frozen-thawed (MacPherson, 1968), or low concentrations of fresh semen (Moller et al., 1972), into the uterine body resulted in higher fertility than deposition into the cervix. It was based on these two studies that the recommendation to deposit frozen-thawed semen into the uterine body became established within the industry. However, entrenched habits meant that up until the mid 1980’s, most inseminators continued to deposit at least one third of the insemination dose into the cervix and two thirds into the uterine body. This practice effectively wastes one third of the semen dose.

What is deep horn insemination

Deep horn insemination (DHI) in this context requires depositing the insemination dose as far cranial into the tip of the uterine horn adjacent to the ovary where the preovulatory follicle resides. This involves two very important steps: Firstly, identifying the ovary which contains the preovulatory follicle by either rectal palpation or ultrasonography; and secondly the technical skill of straightening out the curve in the uterine horn adjacent to that ovary so that the insemination pipette can be placed close (within 2 cm) to the tip of the horn (see Figure 2, lateral view).
The aim is to establish as large a sperm reservoir as possible within the uterine tube closest to the follicle. This is with the knowledge that many sperm will be compromised during the sex-sorting and freezing-thawing process, and so the closer they can be deposited to the site of fertilisation, the better.

**DEEP HORN INSEMINATION – WHAT ARE THE FACTS?**
Higher pregnancy rates have been recorded when frozen-thawed semen is deposited deep into the uterine horn on the same side as the preovulatory follicle, compared to insemination into the uterine body (Fernandez-VanCleve et al., 1986; Lopez-Gatius, 1996; Lopez-Gatius and Camon-Urgel, 1988; Senger, 1993). The difference in these conception rates range from 5% to 10% with frozen-thawed semen. The reasons for this difference are still to be fully understood. But two important advantages of DHI include improved sperm numbers at the uterine tube (Dalton et al., 1999), and reduced inseminations accidentally being placed in the cervix (McKenna et al., 1990).

While there are studies where there have been no differences recorded when conventional and deep-horn inseminations were compared, importantly, there are no studies where DHI has produced poorer results than conventional deposition. For DHI, higher pregnancy rates compared to conventional placement seem to only occur when semen has been compromised (eg frozen-thawed, and possibly sex-sorted) (Lopez-Gatius 1999), AND when inseminators are well trained (Dalton et al., 1999; McKenna et al., 1990; Senger, 1993).

On a comparative basis, in the mare there is definitive evidence that deep-horn insemination improves conception rates with sex-sorted semen when semen quality is poor and insemination numbers are low (Morris et al., 2000).

**DEEP HORN INSEMINATION–CONCLUSION**
1. From a physiological point of view, and supported by mounting practical evidence, it is apparent that there are advantages with utilising DHI. These advantages become more evident as the semen quality is reduced, or if the uterine micro environment is impaired (such as mild uterine infection or in early post partum cow’s).
2. There is suggestion within the literature that DHI may provide between 5 to 10% improvement in conception rates when commercial frozen-thawed semen is utilised.
3. While there is no available cattle data in the literature utilising DHI with sex-sorted semen, the fact that this semen is potentially compromised by the processing suggests there may be benefit in DHI of sex-sorted semen compared to traditional uterine body deposition. There is definitive proof of the value of DHI in mares. The magnitude of the benefit of DHI over conventional uterine insemination will vary with semen quality, inseminator skill and insemination timing.
4. The technique of DHI is a technically demanding skill (on a par with embryo transfer). Even with retrained insemination technicians, there was a 30% variation in results between technicians when DHI techniques were employed. This is in comparison to a 19% variation between technicians with routine deposition of semen in the uterine body (McKenna et al., 1990).
5. If poorly practiced, DHI has the potential to induce trauma to the reproductive tract which may adversely affect fertility. It is suggested that improving the timing of insemination associated with ovulation may provide better results when using these highly processed insemination doses.

**WHAT ABOUT INSEMINATION TIMING?**
The ideal period from insemination to ovulation depends on whether semen is fresh, frozen-thawed, or frozen-thawed and sex-sorted. In 1948 it was found that the best time to inseminate fresh semen was between 24 to 6 hours prior to ovulation (Trimberger, 1948). With frozen-thawed semen this window of timing for insemination lies between 16 and zero hours prior to ovulation (Hockey et al., 2010). The ideal window for inseminating frozen-thawed and sex-sorted semen is yet to be determined. However, intuitively it would be expected to be a duration shorter than for frozen-thawed semen and up to (and maybe within 3 hours after) the time of ovulation.

Recent studies have determined that the majority of dairy cows are inseminated too early, creating a long duration between insemination and ovulation. This is depicted in Figure 3 where it is apparent that the majority of cows (57%) are inseminated between 16 and 32 hours prior to ovulation, whereas the greatest pregnancy rates occur when insemination is between 0 and 16 hours prior to ovulation. This clearly suggests that significant increases in fertility when using processed semen can be made by improving the timing of insemination in relation to ovulation. The use of activity monitors have been demonstrated to greatly assist with insemination timing (Hockey et al., 2010).
Figure 3 - Comparison of AI timing to ovulation and pregnancy rates (Hockey et al 2010)

REFERENCE LIST


