



Your Levy at Work

# dairyinnovationday

— 20/6 —

## Program & proceedings

**Thursday April 28, 9.30am to 3.30pm**

**Hosted by Darren & Sharon Merritt**

Elgin Dairies, 181 Elgin Road, Elgin

*Followed by*

**That evening**



The WA Farmers Industry Dinner, Lighthouse Beach Resort, Bunbury  
Commencing 6.30pm til late

**Next Day (Friday April 29)**

Recovery Breakfast at Gundagai Dairy

Dairy Innovation Day is an example of your Dairy Service Levy "in action"

PREMIUM



GOLD



SILVER



# Dairy Innovation Day Program

9.00am	<b>Registrations, together with trade exhibition and ADF Milking morning tea</b>
10.00am	<b>Opening:</b> Western Dairy chairman <b>Vic Rodwell</b> .
10.05am	<b>Welcome:</b> To Western Dairy's agribusiness team leader, <b>Kirk Reynolds</b> – DID Day's Master of Ceremonies.
10.10am	<b>An introduction to Elgin Dairies:</b> WAFarmers Dairy section president and Merritt family friend, <b>Phil Depiazzi</b> introduces our hosts.
10.15am	<b>Renovating a Business Culture:</b> <i>Darren &amp; Sharon Merritt, family and staff</i> have undergone an 8-month project with HR consultant, <b>Steve Stanley</b> , to re-jig the business's approach to managing labour. Steve discusses the changes this business has gone through and the impact the changes have made.
10.45am	<b>How an HR renovation looks six years down the track:</b> Borden-based lot feeder and grain farmer <b>Paul O'Meehan</b> says he just 'loves coming to work'. That change in attitude has come about by a 180 degree turn around in how he manages and rewards staff by applying the Steve Stanley principles. Hear how this intensive farm business has benefited from a new approach to managing staff.
11.00am	Western Dairy's <b>Kirk Reynolds</b> introduces our 6 <b>Brownes Dairy Young Dairy Farmer of the Year</b> Finalists and says a few words on their journey so far.
11.05am	<b>The Rabobank message:</b> Rabobank has been a foundation supporter of Innovation Day and state manager <b>Steve Kelly</b> shares his company's perspective on the WA dairy industry opportunities.
11.10am	<b>How dairy interfaces with the South West Development Commission (SWDC) Blueprint:</b> Western Dairy values the strategic relationship it holds with the SWDC and <b>Patrick Warrand</b> provides a brief overview of the importance of linking industry with development commissions.
11.15am	<b>The Innovation Day Milk Crate Trail:</b> Led by the legendary man from Have Gavel Will Travel, <b>Tiny Holly</b> . Tiny meets: <ul style="list-style-type: none"> <li>• Philmac's <b>David Young</b> to run through the K-Line Irrigation System; and</li> <li>• Nathan Tognela from PGG Wrightson Seeds. Nathan has put together six trial bins showcasing some of PGG Wrightson Seeds latest cultivars, come over and have a look!</li> </ul>
11.25am	<b>And then, out to the exhibition with a demonstration from Coopers on their latest oral cattle drench:</b> With so much to see and this year's DID, this rapid fire session gets you off your seat as Tiny leads you through the Innovations and ideas on display. He is literally 'standing on a milk crate' as he helps you explore DID Day.
<b>Lunchtime</b>	<b>Landmark BBQ luncheon available:</b> <i>With snacks and drinks available at each station as the crowd rotates.</i>
12.00pm	Innovation Day Workshops (these workshops are running concurrently and are repeated so delegates can attend all). They run for approx. 45 minutes each, with 10 minutes to shift between locations. Maximum 100 per group.

## Workshop 1 - Technology

Hosted by DeLaval

In the new Merritt dairy - with Patrick Hunt



10 minutes	<b>Introduction to the Merritt Dairy:</b> An exploration of the dairy's design features and the rationale behind it. - <i>Kim Norwell from De Laval with support from Sam Taylor.</i>
35 minutes	<b>Automated Heat Detection:</b> Two competing products offering automated heat detection systems are being trialled at the Merritt Dairy. The DairyKing MooMonitor+, distributed by Daviesway and the World Wide Sires Cow Manager are presented and demonstrated. Leading the discussion is independent veterinarian <b>Dr Carl Hockey</b> , from Rural Vets Qld.

## Workshop 2 – Nutrition – the start of great fertility

Hosted by Rabobank  
In the Calf Shed



Rabobank

25 minutes **Calf-rearing Merritt style:** The Merritt calf shed is widely considered to be one of the most innovative and efficient calf sheds in the state. The design is a 100% Merritt design and build and **Darren** takes the crowd through his system that produces one of the best survive and thrive rates in the state.

10 minutes **Ruminating:** Western Dairy RD&E Hub nutrition expert **Ruairi McDonnell** digs into the Merritt calf nutrition plan and identifies the strengths and opportunities of the system.

10 minutes **Lime Research:** Western Dairy RD&E Hub Senior Scientist **Dr Martin Staines** will be presenting new findings from a three-year plot experiment at Vasse Research Station, focusing on lime application practices on WA dairy farms.

\* While you are visiting the Calf Rearing shed, take a moment to meet the team from **DSY Engineering** who provided the engineering services on the calf shed and the dairy.

## Workshop 3 – Fertility & Genetics

Hosted by Zoetis  
In the Cattle Yards



5 minutes **Zoetis welcome:** Zoetis's genetics technical services manager, Emily Piper introduces the session.

30 minutes **Optimising the performance of the first calvers:** Always on the look out to improve, the Merritt's are seeking greater reproductive performance out of their heifers. CattleVets **Dr Ian Bradshaw** has been commissioned to take a look at the Merritt herd and the value of weight accuracy in optimising reproduction.

10 minutes **Breeding Made Easy:** Get out your smart phones and follow the prompts with ADHIS's **Sarah Saxton** to discover the Good Bulls App and how it can work for you.

2.45pm Wind up: - with Dairy Australia's **Shane Hellwege**

## Industry Information Booths

- **Western Dairy's RD&E Project working for your business:** Take a look at the Rumen8 tools; and the latest recommendations on Potassium application rates and the Dairy Farm Monitor Program report for 14/15.
- **National Centre for Dairy Education:** Dairy Australia's IPAC team leader Shane Hellwege and his team showcase dairy training opportunities highlighting the many services Western Dairy can offer to support people development and HR systems on your farms.
- **Managing Mastitis:** The Dairy Australia's Erika Oates is in attendance - a great chance to talk about booking your staff into the next Cups On Cups Off course.
- **Dairy Employment Starter Kit and the 457 Visas:** Get the latest on these important issues from our dairy HR consultant Tammy Negus.
- **Young Dairy Network:** An opportunity to sign up to the 2016 activities including the Young Dairy Farmer tour to NZ in December.
- **Bay Signs:** An opportunity to purchase the full set of OHS signage to help compliance in your dairy.
- **Worksafe:** Yep, an opportunity to check in on your farm's OHS systems in a 'safe' environment!
- **Industry Skills Fund:** Kerry Nathanielsz a skills advisor from the Industry Skills Fund together with Roban-Lynne Clarke from AusIndustry (The Department of Industry, Innovation and Science), are armed with all the information to help you access Government funding to help your business to grow.
- **WA Farmers:** This organisation can only benefit from your membership. Why not take the chance to sign up.

## Plus all your usual exhibitors and more!

- Bunbury Machinery, Farmwest, Elders, Landmark, Brunswick Agencies, Rabobank, Zoetis Australia, Coopers, Philmac, PGG Wrightson Seeds, CSBP, Summit Fertilizers, Harvey Farm Services, Heritage Seeds, Geocatch, South West Development Commission, Unifarm, ADF Milking, Bay Signs, DSY Engineering, DeLaval and more!



Your Levy at Work

## About Western Dairy

Western Dairy is one of eight Regional Development Programs that are spread throughout the Nation's key dairy areas and operates under the auspices of Dairy Australia. Western Dairy has been operating since 1997 to develop a strategic direction for dairy research, development and extension programs in the western region.

Over the last 12 months, Western Dairy has been able to significantly expand its presence in WA and now has a team of three full time on-ground staff (based in Bunbury) working with regional manager Esther Jones to deliver a range of services to the WA industry.

The most isolated dairy state in Australia, WA must work hard to ensure its policies are linked and fully integrated with national policies and that the research and extension work that is carried out in the West is complimentary to that in other states and regions. Part of the way Western Dairy does this is through the prioritising and facilitation of major research and extension projects that will help enhance the sustainability and profitability of this industry. Dairy Innovation Day is just one example of that. However, virtually every 'dairy related' activity you see in this state, has some connection to Western Dairy and your levy.

WA dairy farmers have all had opportunity to take part in our many complimentary events and activities.

Our suite of field days, farm walks and seminars span topics from business and people management, to feed systems and nutrition; effluent designs, compost production, soil health and much more. We are particularly proud of the development of the nutrition software package Rumen8 (which is available for free via the Western Dairy website); and also the recent release of a suite of farm business tools linked around the ESKi (or the Employment Starter Kit initiative). There are now great tools supporting farmers wanting to explore new business models, especially around share farming.

Meanwhile, keep an eye out for FeedTrough – a great little publication edited by agronomist Tammy Negus – who heads up our feedbase interest group. Tammy is taking on a number of projects for Western Dairy. Her roles includes rolling out the ESKi's with one-on-one consultations for those seeking assistance in the employment and contractor space.

## Support and Sponsorship

The remarkable Dairy Innovation Day – which is offered free to dairy farmers – would not be possible without the support of sponsors and exhibitors. Western Dairy asks that delegates acknowledge the sponsors of today's event and spend time with each of them to show just how much we appreciate their support.

## The Merritts

No Dairy Innovation Day would be possible without the generosity of the host family. This year's hosts are no exception. Darren and Sharon Merritt and their family and staff have thrown open their farm business and they have thrown open their minds to taking on a new approach to human resource management – all while building a new dairy for us all to view during the day.

On behalf of Industry, Western Dairy extends the most sincere of thankyou's to this family for their hospitality.

## The Western Dairy Board 2016

**Vic Rodwell**  
Chair

**Grant Evans**  
Vice Chair

**Brian Piesse**  
Director

**Mat Daubney**  
Director

**Ruben Zandman**  
Director

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## Acknowledging the Sponsors and Exhibitors

Western Dairy would like to acknowledge the following sponsors and exhibitors, without whose support the event would not be possible.

- Dairy Australia
- South West Development Commission
- Bunbury Machinery
- Rabobank
- Philmac
- Zoetis
- De Laval
- PGG Wrightson Seeds
- Coopers
- National Centre for Dairy Education
- DSY Engineering
- ADF Milking
- Coopers
- CSBP
- Harvey Fresh
- Landmark
- Summit Fertilizers
- Elders Bunbury
- GeoCatch
- Brunswick Agencies
- Farmwest
- Industry Skills Fund
- Unifarm
- Heritage Seeds
- Harvey Farm Service
- Bay Signs

## The WAFarmers Dairy Dinner

The Bunbury Machinery drinks followed by the WAFarmers Dairy Industry Dinner, with support from National Centre for Dairy Education, takes place at the Lighthouse Beach Resort tonight, with pre dinner drinks commencing at 6.30pm.



# WAFARMERS

## ***Dairy Industry Dinner***

*A wonderful night of fellowship and celebration of all things dairy*

**April 28, 2016 Lighthouse Beach Resort, Bunbury**

**Commencing with Bunbury Machinery  
Pre-Dinner Drinks at 6.30pm**



### *Incorporating:*

- The Brownes Dairy Young Dairy Farmer of the Year Award.
- Charity Auction to raise funds for the Western Dairy young farmers tour to NZ

*Brownes*

# The "Recovery" Breakfast And tour of Gundagai Dairy

Hosted by the Scott Family  
Gundagai Dairy, 1022 Gavins Road, Boyanup



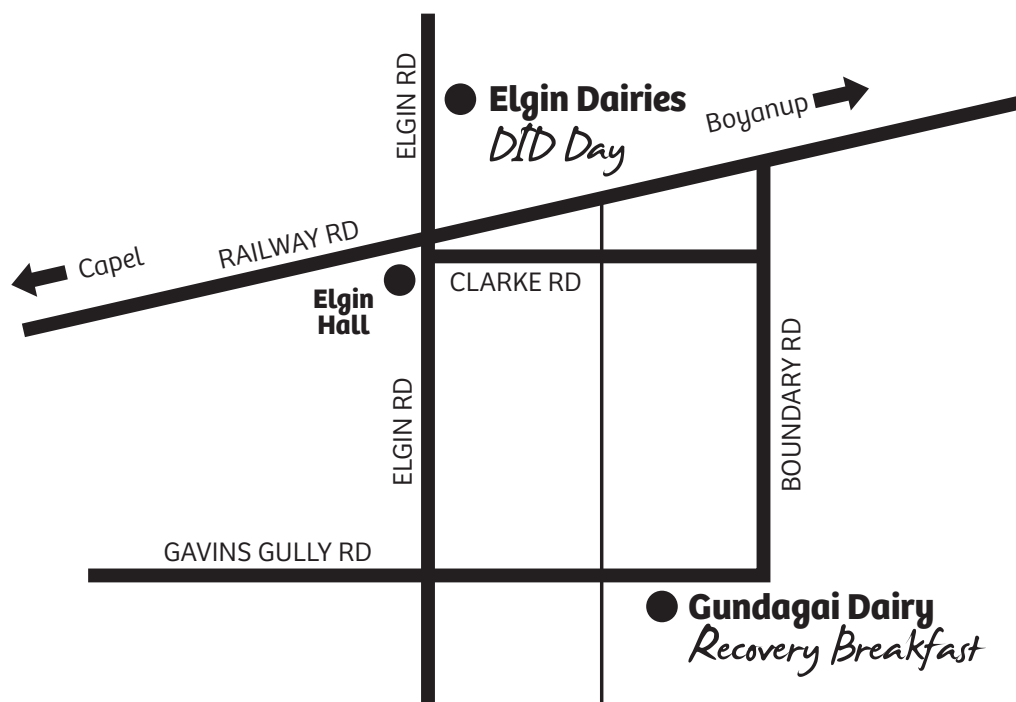
Your Levy at Work

## The morning after DID-Day!

8.30am for the Harvey Fresh breakfast

9.00am -11.00am farm system overview

The focus of the morning will be the Gundagai calf rearing system and the efficiencies of this business.



More information: [jessica@westerndairy.com.au](mailto:jessica@westerndairy.com.au)



# ***Papers and Information of Reference***

The documents in this next section of the proceedings are designed to support the information you have been presented with today.

The pages that follow include the background to the presentations delivered by our keynote speakers, Steve Stanley and Dr Carl Hockey; as well as papers to support the science presentations prepared by Dr Martin Staines and Ruairi McDonnell.

We have also enclosed for you a series of Dairy Notes prepared by our Dairy R&E team members summarising the findings of recent research projects.

We consider the information in this booklet to be of great reference material.

The booklet in its entirety will also be available for download from [www.westerndairy.com.au](http://www.westerndairy.com.au)

# Working with farms and farmers

**Steve Stanley**

Managing Director  
TeamSmart

Believe it or not, farms are little different to any other workplace. Sure, farms have many differences to other places, but the major common issue is the one that requires the most attention – people. The only farms, and farmers, with which I can work, are those who want their teams to improve and are aware that the quality of their people is paramount to great results. When you find those with these beliefs, success is, not just possible, but real.

Before starting on the mechanics of human resource documentation and processes, it is essential to get everyone moving in the same direction, and have them work as a team. There is some theory, delivered through humour and participation, which the whole team needs to know and have sink in.

We first need to be aware of our mental models. Each of us has hundreds of them. They are a combination of our beliefs, values and the assumptions we make about life. Mental models are the blueprints for our behaviour. The way we behave is, without question, determined by the beliefs and values we hold.

Why did some of us drive Holdens, while others drove Fords? Why do some support the Dockers and others the Eagles? Why do some folk train to stay fit and others don't? The answer is the same – it's the beliefs and values that you hold. How do you create habits? How do you break them? You can if your beliefs change! Sadly, there are some mental models that are dysfunctional. Those who choose a path outside the law, do so because they have dysfunctional values. However, it's what they know and believe is the path for them. Why are so few criminals rehabilitated in our current prison system? The system does not work on changing the mental models, so rehabilitation fails.

So, where do these mental models come from? They build through every experience you undergo throughout your life. They're filtered through your genetics, admittedly, because no two of us are the same. Which means your genetic make-up, added to the experiences you undergo, create the mental models that drive your behaviour. I tell managers and executives, sports men and women, and anyone interested in growth and development, that you cannot change anyone's behaviour or performance, unless you can change the mental models that drive that behaviour. Telling anyone older than a teenager, how you want him or her to behave, is fruitless.

If I have a solid belief, born from the experiences I've had all my life, that you just can't trust anyone, then my relationships are going to be difficult. It's going to take some real work to change that mental model and have me trusting others. On the other hand, if my experiences have me trusting others and I build relationships accordingly, I treat people quite differently. Telling me to trust others, or that no one is trustworthy, has no impact. I have to understand that my beliefs and values are flawed in order for my behaviour to alter.

It is extremely difficult to assess the effectiveness of your own mental models, because you look at them through the filters of your own mental models! It's like examining the impact of the French revolution through the eyes of the peasants, or the aristocracy. Wherever you come from, will give you a totally different view. It's also like looking at an industrial dispute from the point of view of management, or the workforce. It's why the 'obvious' solution, which you see from the outside, seems to take so long to arrive at. The key is always, where are you coming from. To understand others, the expression goes, walk a mile in their shoes. What that really means is, try and look at the world from someone else's viewpoint. It's very hard to do, look from a stance other than your own. The further removed from your beliefs and values, the harder it is to 'understand'. Let's face it, from the comfort of suburban Perth, it's so hard to see things through the eyes of a terrorist. It's so far removed from our mental models there is little connection.

It's not so removed in the workplace or the home. Compared to the divergent beliefs above, trying to understand the thinking of your teenager is not so arduous. Making the effort to understand where a member of your work team comes from is not beyond your capacity. A friend of mine recently, told me a story that sums it up well. She was responsible for a renowned international author and expert in his field, as his professional assistant, aide. They were dining at a restaurant and she was getting more perturbed over the performance, or lack thereof, of the waitperson. She was getting 'hot under the collar'. After expressing herself rather well, based on her anger, she turned to the table. She asked the celebrated author why he never got angry. He said there are two reasons. One, it's not worth me getting upset about, but, two, and most importantly, how do you know what's going on in that person's life right now. They may have a sick child, been told this is their last shift they've been let go, or, received bad news about a loved one. So, unless you know where they're at right now, you shouldn't judge.

Once we understand what drives people we can work on aligning them. The importance of a vision, what we are trying to achieve, is vital. It's time to sit with the farmer and their family, to talk in detail about what the farm will look like in 3-5 years time. There are some who talk about 10 year visions. It's extremely difficult to think about what anything can look like in 10 years time.

Anything can happen. A good vision paints a very real and believable picture. If you can see it, you can reach it. If it's over the horizon, it's hope, and hope is not a strategy!

Once the farm family agree on the vision, it is time to 'sell' it to the team. This requires getting it up in front of them, having the farmer describe what they see and discussing whether it is where the team wants to go. It is possible to lose someone at this point. If you have a team member who cannot see the vision, or disagrees, they may choose to opt out. The reality is, you don't want them, if they are going to work against what you want to achieve, or worse, undermine you.

Einstein once said that insanity "is doing the same thing over and over, and expecting different results". If each member of the team behaves in the same way, then the results cannot be different. In order to reach the vision, behaviours must change. You make that change by all agreeing to values (behaviours) that everyone must abide by, at all times. In other words, change what we do, how we treat each other and how we work.

The most effective way of creating the values is this. We hold a discussion with the group on what makes a really great team. What are the characteristics of a team that is effective, works well, and makes you want to be a part. The team is then asked to write, anonymously, on a slip of paper a score out of 10. One means there is no team, merely a group of individuals earning money. Ten means it is a brotherhood, people as close as your family, and as important to you, and the results are outstanding. The numbers are added and an average obtained. This is then revealed. Let's say it's 6. We then list the behaviours that need to change to take the team from 6 to 10.

Once the list is compiled, a vote is taken. The method used is called 10/4 voting. There is no requirement to explain it here, however, it allows all members of the team to have equal say. The most important 4 or 5 values are decided. The team spends some time talking about those values and what they mean to them. Once there is some clarity over what they mean agreement is then set that each team member will strive to live these values. They are tasked with providing real, behavioural examples at the next meeting of team members they have observed living the values. This creates two things. One, examples of what is expected are built over time from within the team. Secondly, each member is more aware of the values, as they are forefront in the mind while looking for examples.

Over time, the values become 'the way we do things around here'. They require constant vigilance. They do provide many advantages. One of them is the way the boss attends to issues with team members. Where someone strays, and it will happen, it is much more effective to gather the person and have a conversation based on, "Tell me how what you've just done fits within the values we have set?" A conversation based on the values and how they apply has greater impact than a conflict situation.

From this point, there are some tools explained that assist to reach the vision. We look at:

- Levels of Perspective – a model of leadership that creates a focus on working on the vision and aligning mental models, rather than dealing with events and behaviours. In order to create the time to focus on the effective domain, systems and structures are established to deal with the day-to-day. It is often surprising, when the enthusiasm and the abilities of the team are utilised, how others enjoy the additional responsibility and perform in ways you hadn't thought possible. It's about trust.
- The Trust Equation – the level of trust between two people can be assessed using a formula. It looks like this:

$$\frac{\text{Intimacy} + \text{Reliability} + \text{Credibility}}{\text{Self-Interest}}$$

Intimacy is the degree to which you know someone. It takes time, but also effort, to understand someone and develop a rapport. Reliability is whether you do what you say you're going to do. If you complete what you need to do, on time, with quality, your reliability is high. Credibility is whether you tell the truth or bullshit. The interesting quality here is, you can tell the truth every time, but get caught telling a lie, and every truth turns into doubt. It is so easy to destroy your credibility and so hard to get it back again! Add these factors together, but then divide by the degree of self-interest you believe motivates the other person. It works both ways. A team member volunteers to fill in shifts for others. Noble. If it is purely for the money, when their debt is paid off, or something more important comes along, you can't get them to do a fill-in shift. In the other direction, if a manager is doing all the right things by staff, but they believe it is to get a promotion and they really don't care, it unravels. So, you trust people more if: a. you know them well; b. they always speak the truth; and c. they do what they say they'll do. It is a high rating if you believe your interests are foremost in their thinking, low, if you think they're actions are in their own self-interest.

- Circles of Concern/ Influence / Control – it's important to understand that you can take control of your life and eliminate stress by letting go the issues you can't influence. The outer circle contains all of the issues that you are concerned about that happen in and around your life. The inner circle contains the things that concern you that you can influence. It is about letting go of the things that you can't influence and getting off your butt and taking action with the things that you can. The model also refers to a third circle inside the Circle of Influence, which is even stronger, the things you can control. It is about control of your life and taking the action needed to live the values and reach the vision.



- Dreyfus Model – this is a model of behaviour that shows where anyone is at, at any time, on a continuum from novice, through beginner, competent, proficient, to expert. It shows how to get the best from those anywhere on the continuum and how to speed up development. It is an essential tool, not just for managers, but also for everyone in the team so they understand where others are at and can assist.
- Feedback - One thing sure to put fear into anyone, is to be told, “Can we have a word? I need to give you some feedback.” The mind immediately starts churning and trying to determine what you’ve done wrong and how severe the kicking will be. It’s not only the person about to receive the feedback who is in a state of nervousness, it’s also normally the person about to give the feedback who is afraid of the confrontation. Why? Very few people know how to give or receive feedback. Therefore, it creates anxiety, sometimes severe.
- Stop/Start/Continue (SSC) – this is the primary tool for bridging the feedback gap, i.e. going from poor, or no feedback, to being able to give and receive it freely and constructively. A SSC requires the person to receive the feedback to leave the room. The rest of the team discuss, and we write down for all to see, firstly, the things we feel that person should stop doing, as they do not contribute to harmony, or better work. Once that list is done, we move on to the things they should start doing, that they are not doing now. Finally, we list all the things they should continue doing, as they do them pretty well. The person then returns and we deliver the feedback, and they are not allowed to respond, other than to ask clarifying questions. They take the results away with them and think about it. If they feel there are things that like to change, or improve, we can help them.

Once these models and tools are in place, it is a process of working together to ensure that they are used and we move progressively towards the vision. There will be setbacks, mistakes, and real progress at times. There can be two steps forward and one back, but progress is always in the right direction. At some point, there will be a break-through, and it all comes together in everyone’s mind.

It is a matter of working together. It doesn’t get in the way of farm work, but enhances it and makes it more efficient and more solid. More is achieved together. Where it comes to the farm, we take major events, such as seeding, or time frames, such as every 6 months, and run a diagnostic over the operation. Everyone gathers and we look at a PMI, an Edward De Bono thinking tool. We first, jointly, look at all the Positives, everything that’s worked. Next we look at the Minuses, what didn’t work, or we could do better next time. Finally, we examine the Ideas, what’s sprung to mind that we could do, purchase, and alter, so that we get a better result next time.

The farmer works with this list and makes the changes necessary, or leads the team in making the changes. Values are particularly important when conducting a SSC, or a PMI. As we’ve said, they drive the behavioural change we need to become better at what we do.

One of the issues when looking at a PMI is feedback. It is important to answer everything on the board. In particular, if someone suggests a new piece of machinery is purchased, they need to understand how it can or can’t be done, according to the budget. The team members are not silly, and will work with you to achieve a result if they are not kept in the dark. Once they know, where in the budget, the priority for purchases lies, they will be satisfied and keen for the farm to succeed. When simply told, no, or worse, ridiculed, for suggesting a purchase, be it large or small, they will lose heart and you can see the motivation ebb away.

The final piece of the puzzle is to have the transactional issues under control. While all the above is going on, we actively work with the ESKi tool on the Dairy Australia website to ensure that all staff are paid according to the award, have duty statements, contracts of employment and understand their roles and responsibilities. Dairy Australia and ESKi makes it easy. The templates are there, the information is readily available and getting it right, is pretty simple.

In the final wash, we have staff motivated to change behaviour according to the values, in order to reach the vision of the farm. Everyone is assisted with the people tools and models to get there. The requirements of employment are taken care of, leading to a team that knows what it wants, knows how to get there, and has all the right components in place to bring peace of mind to everyone.

*Footnote:*

*In July of 2015, Dairy Australia contracted Steve to work with Elgin Dairies to assist with their team and the HR matters required on a dairy farm. At the time the contract commenced, the workforce were not clearly aligned, the farmers were asking for support to organise the HR matters that were completed as best as they could, under the stresses of time and lack of experience. The first step was to establish a vision for the farm with the family. It was essential that agreement was clear here so that it could be sold to the team. Once that was completed, we had a session with everyone and established an understanding of mental models and what is required to make improvements and reach the vision. We established the vision and a set of core values, that everyone agreed to work within.*

*As is normally the case when this process starts, we lost some staff. Some embrace change, others just don’t want to go down this path, and that’s fine. Currently we have a solid team, who are focused on where we’re headed, keen to work towards it, and completing the HR documentation to solidify the agreements after the opening of the new dairy. There is a positive future and a high level excitement on the farm.*

# Heat Detection – the “State-of-the-Art”

*Dr Carl Hockey*

*BVSc (Hons) PhD, RuralVet*

## Background

Knowing which cows to inseminate and when to inseminate them has been an important part of managing dairy herds with artificial insemination (AI) ever since its first use in dairy herds nearly 100 years ago. For many years we relied solely on direct observation of cow behaviour to detect cows in heat. Later, with the advent of heat detection aids such as tail paint and heat mount detectors we were able to get indirect insight into what had been happening when we were not looking. Now 24hrs a day and from anywhere in world we can receive text messages and push notifications from smart phone applications connected to the internet giving us real-time information about which cows are on heat and exactly when the heat began. We can also get a whole range of other useful nutritional and health information in real-time such as the cow’s grazing, resting and rumination patterns. Amazingly the principles used by current 21st century technology to detect cows in heat have been known about for a very long time. It was as early as 1954 when E. J. Farris first used mechanical pedometers to show the relationship between cow walking activity and time of heat. It has taken all this time for technology to catch up and for us to use this knowledge in a practical way in commercial herds, but automated heat detection is now a reality.

To showcase modern heat detection technology, in the lead up to the 2016 Dairy Innovation Day two commercial heat detection systems were installed in the same herd and tested on the same cows. Both Cow Manager ear tags and Moo Monitor + Neck collars were placed on a group of around 25 cows at Darren and Sharon Merritt’s farm in Boyanup WA. Although not being a rigorous scientific trial the exercise provided an excellent demonstration of the capabilities of two state-of-the-art systems. The following article reviews the general performance of current automated heat detection systems and highlights some of the features from each of the two systems demonstrated on the Merritt’s farm.



*Cow Manager Ear Tag World Wide sires*



*Moo Monitor Neck Collar Dairy Master*

## How good is technology for detecting cows in heat?

Most cow activity meter systems will detect about 80-95% of cows on heat with about 80-95% of the alerts they create consisting of cows truly on heat. To understand this better let’s use an example of a herd that has around 200 open and cycling cows ready for insemination. Without the use of any synchronisation treatments there will be approximately 10 cows on heat on any given day. Most activity meter systems will alert approximately 10 cows per day as being on heat in this scenario. However, those 10 alerts will consist of 8 or 9 cows from the 10 cows that are actually on heat and 1-2 cows from the rest of herd that are not on heat. So how does this compare with your current performance using visual observations with or without tail paint or heat mount patches? The only way to know is if you measure your current performance. It is not easy to do this accurately but there are a number of ways you can get a rough idea on current performance. To do this it is a good idea to get help from an InCalf accredited adviser who can create a Fertility Focus report or use other tailored methods to help you work this out. Contact details of current advisers are listed on the Dairy Australia website.

## How good is technology for knowing when to inseminate cows?

The onset of increased cow activity associated with heat has been shown to be a very good predictor of when the cow will ovulate and occurs roughly 30 hrs before ovulation. This makes it an ideal indicator of when best to inseminate a cow. Most commercial activity meter systems report activity in 1-2 hour time blocks which means that you can know very precisely when the cow came on heat and make the best decision about when to inseminate them. The reported optimal time for insemination following the onset of increased activity varies between studies but is approximately 16 hours. However, there is a wide range of times either side of this where acceptable conception rates are likely to be achieved.

## What will it cost me?

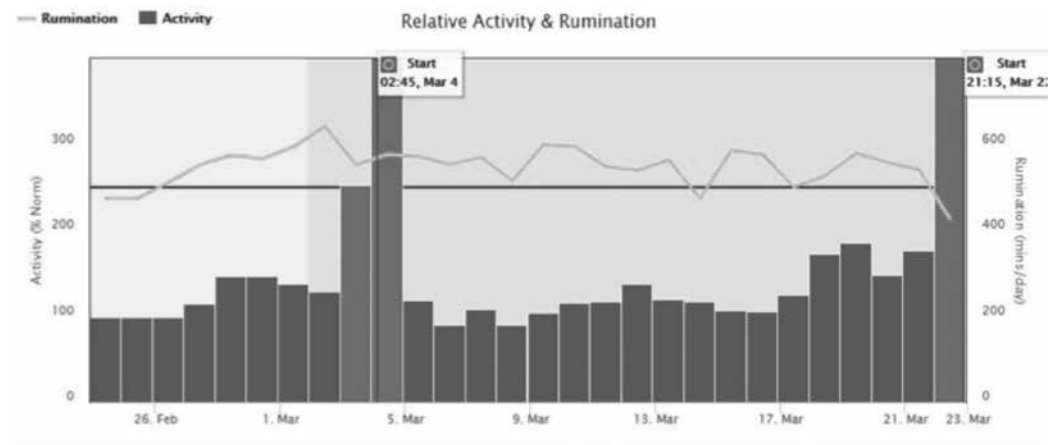
There are around a dozen different heat detection technology systems available in Australia at present and the price of each system can vary greatly depending on what features you want. For example, if you just want heat detection by itself or if you wish to include other features such as monitoring of rumination, grazing or temperature etc. Other differences affecting setup costs include real-time monitoring of cows in the paddock versus only downloading of information at milking time. As a rough guide, the total setup costs for a 200 cow herd could set you back between \$30,000 to \$50,000. This is made up of per cow device

costs of approximately \$100-\$200 and infrastructure costs of around \$5,000-\$15,000. A prerequisite for many of the systems is a computer and internet access close to the dairy.

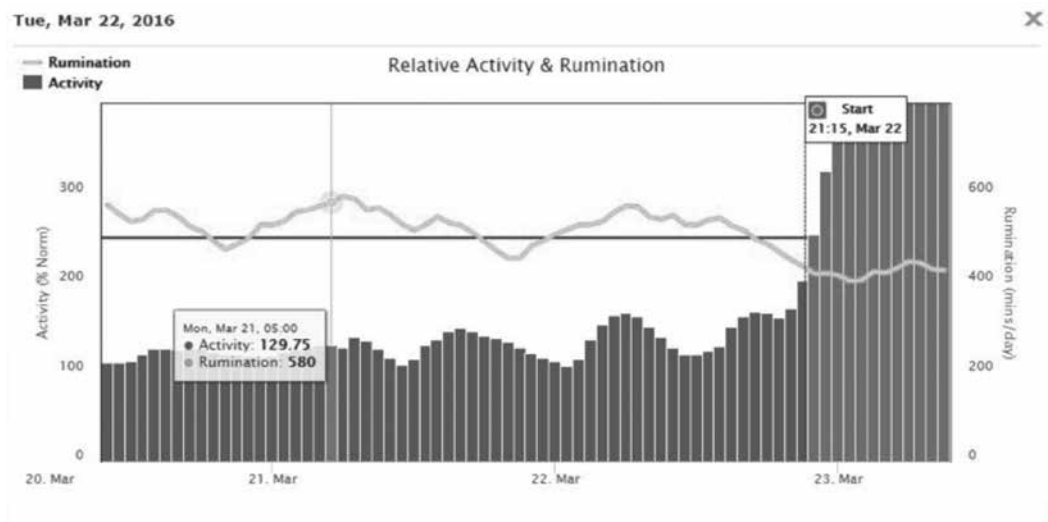
## What does it look like and how would I use it on my farm?

### Moo Monitor +

The following two images are screen shots from the DairyMaster's MooMonitor+ taken from cows on Darren and Sharon Merritt's farm in Boyanup WA in March 2016 in the lead up to Dairy Innovation Day. These graphs along with a range of other cow reports and data can be accessed by logging in on any web browser in the world connected to the internet or using a free downloadable app on a smart phone. That makes it extremely accessible wherever you are. All information is stored in the cloud so there is no software, networking or back up of data required to be managed by the farmer. The first image shows the cow's relative rumination and heat behaviour readings over roughly a one month period. There are two clear periods of heat behaviour about 20 days apart and the second period of heat behaviour is also accompanied by a marked drop in rumination.



The second image is a close up of the heat behaviour and rumination during the last 3 days in the first image and shows the precise time of onset of heat behaviour.

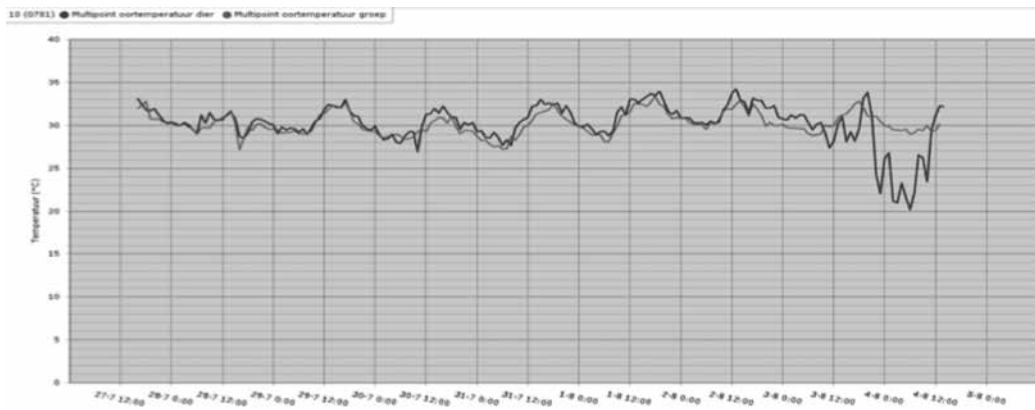


In MooMonitor+ alerts are created by the program when a cow is on heat, or when its behaviour changes beyond a threshold from what has been its normal behaviour over the recent past. This can be a change in feeding, a change in resting, a change in rumination, a change in its activity levels or a combination of these factors. These alerts can be sent to you by push notifications using the app on your smartphone or you can log in on any internet device and retrieve reports in real-time whenever it suits you. All reports can be exported to csv or pdf and automated rules can be created to set drafting of cows based on alerts.

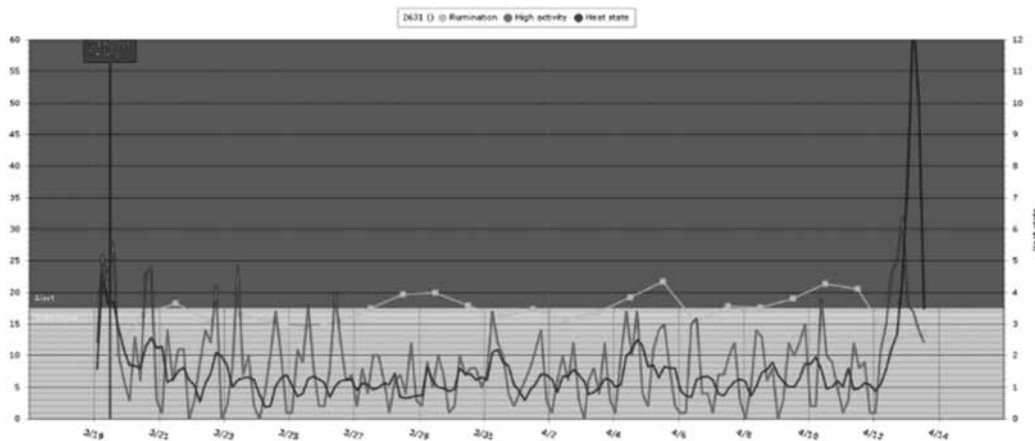
### Cow Manager

The Cow Manager system shares many of the same features with the Moo Monitor + but also includes the addition of a temperature sensor and instead of being held against the cow's neck with a collar it is held on the ear by attaching to an NLIS tag. Monitoring changes in a cow's rumination and activity behaviour along with temperature can give a very early indication of sickness. Despite

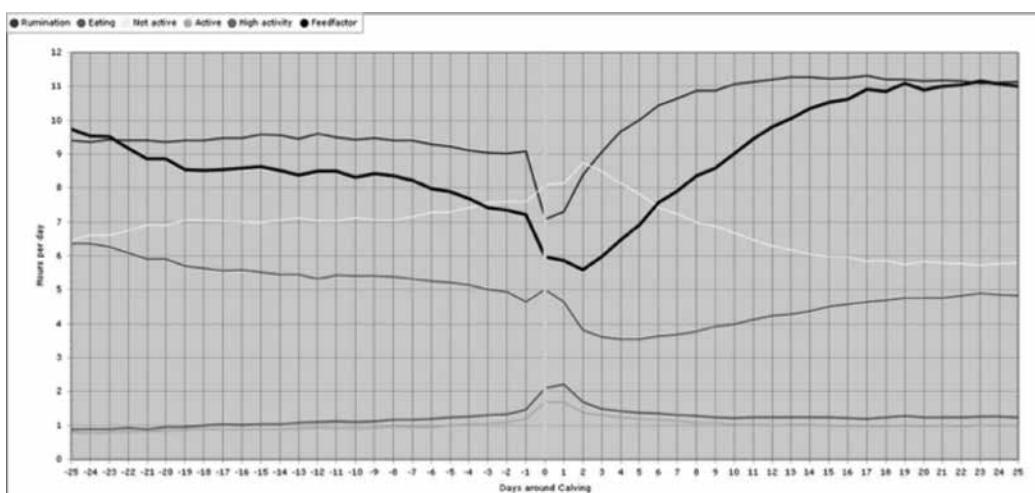
core temperature increasing in many diseases ear temperature will normally decrease due to reduced blood flow to the periphery. The following images are screen shots from the Cow Manager browser. The first image shows the drop in a cow's ear temperature relative to the rest of it's herd mates at the time that cow became ill.



The next image shows a graph of the changes in cow rumination, high activity periods and heat status over a full heat cycle. Similar to the first Moo Monitor + image, this graph also shows a clear example of rumination decreasing and high activity increasing at the time of heat onset. While both of these changes don't always occur together in all heats the use of more than one parameter to determine the heat status increases the accuracy of heat detection compared to just using any one parameter alone.



By classifying cow behaviour into rumination, eating, not active, active, and highly active the Cow Manager can show a wide range of changes that take place during many health or reproductive events. An example of this is shown in the second Cow Manager image which highlights the marked changes that occurred in these parameters for a cow at time of calving.



Another useful application of these parameters is monitoring changes in herd level nutrition by creating a "Feed Factor" parameter that is made up of the combined rumination, eating and inactive behaviour of the group. By monitoring changes in the herd's "Feed Factor" the whole herd feed intake reactions from feed ration and pasture management changes can be observed in real time so steps can be taken sooner to reduce any negative consequences of a nutritional upset.

## Getting the most from technology

Despite a few differences, both Cow Manager and Moo Monitor + can provide farmers with useful up to date information on a cow's reproductive, health or nutritional status. However, regardless of which system you use neither should be treated as a set and forget system. To get the most from these technology systems you will want to review the computer generated alert reports at least one or more times a day and then look at each set of graphs for cows on the alert list and interpret them in light of any previous known history and current direct physical observations. Combining computer generated alerts and data with direct knowledge of cows allows you to make the most informed decisions on each cow's status and take the most appropriate and timely action for either reproduction, health or nutrition.

## Conclusion

Technology for detecting cows in heat has come a long way over the years. Current technology can now provide practical and accurate ways to know which cows are on heat and when to inseminate them. These are two critical questions being asked every day in herds managing reproduction with AI. The big questions now are not what might be possible with technology or does the technology really work? The important questions are; do I need this technology on my farm; is it going to add value to my enterprise above its costs; and if so how do I best use it to maximise the return it will bring me? The answers to these questions are going to be different for each farm. When answering these questions take your time, do your homework, know there are plenty of options on the market and don't be afraid to seek help from someone independent that you trust.

For more information on what to consider when purchasing heat detection technology download a free guide to automated heat detection from Dairy Australia's website. <http://www.dairyaustralia.com.au/Animal-management/Fertility/Heat-detection.aspx>



## Overview of key features of Cow Manger and Moo Monitor+

Heat Detection Technology	Cow Manager	Moo Monitor+
Australian Distributor	World Wide Sires	Daviesway
Manufacturer	Agis Automatisering BV, Netherlands	Dairymaster, Ireland
Key Management Features	<ul style="list-style-type: none"> <li>• Fertility</li> <li>• Health</li> <li>• Nutrition/Feeding</li> </ul>	<ul style="list-style-type: none"> <li>• Fertility</li> <li>• Health</li> <li>• Nutrition/Feeding</li> </ul>
Additional Features	<ul style="list-style-type: none"> <li>• Find my cow (not currently available in Australia)</li> </ul>	<ul style="list-style-type: none"> <li>• Near Field Communication – collars can be scanned in and assigned in real time using an android mobile phone</li> </ul>
Sensor/s	<ul style="list-style-type: none"> <li>• Tri axial Accelerometer</li> <li>• Electronic thermometer</li> </ul>	<ul style="list-style-type: none"> <li>• Multi-axis MEMS Accelerometer</li> </ul>
Sensor Attachment	Ear tag on NLIS tag	Neck collar
Data collected	<ul style="list-style-type: none"> <li>• Cow movements – acceleration and direction of movements at ear</li> <li>• Peripheral temperature at ear</li> </ul>	<ul style="list-style-type: none"> <li>• Cow movements – acceleration and direction of movements at neck</li> </ul>
Data interpreted as	<ul style="list-style-type: none"> <li>• High activity</li> <li>• Active</li> <li>• Non-active</li> <li>• Rumination</li> <li>• Eating</li> <li>• Temperature</li> </ul>	<ul style="list-style-type: none"> <li>• Heat Behaviour Activity</li> <li>• General Activity</li> <li>• Resting</li> <li>• Rumination</li> <li>• Feeding</li> </ul>
Data collated into time blocks of	5 min	15 min
Data update interval	15 min	15 min
Device data storage duration if not transferred to router	9 days	48 hrs
Data Transfer from device to router	RF up to 250m to router	RF 1 km + direct to base station.
Data transfer from router to user interface	<ul style="list-style-type: none"> <li>• RF up to 1 km from router to coordinator connected to fixed computer in dairy.</li> <li>• From coordinator computer in dairy to cloud via internet connection.</li> <li>• From cloud to any internet device</li> </ul>	<ul style="list-style-type: none"> <li>• From cow device direct to base station</li> <li>• From base station to cloud via SIM card (3G or 4G cellular data network), wifi or Ethernet.</li> <li>• From cloud to any internet device</li> </ul>
Additional user interface options (other than base PC)	<ul style="list-style-type: none"> <li>• Cow Manager Android app</li> <li>• Any internet connected web browser</li> </ul>	<ul style="list-style-type: none"> <li>• Moo Monitor Web App (iPhone and Android)</li> <li>• Any internet connected web browser</li> </ul>
Router power options	Solar, battery or mains power	Base station 12v battery (solar option) or mains
Estimated Battery Life	5-10 years	Device life estimated at 10 years
Warranty Period	5 years on sensor	Seven year pro- rata warranty on sensors 2 years full replacement
Cost of sensor devices (ex GST)	<ul style="list-style-type: none"> <li>• Approx. \$100 heat only (200-300 devices)</li> <li>• Approx. \$190 heat, health and nutrition (200-300 device)</li> </ul>	<ul style="list-style-type: none"> <li>• \$160 heat only</li> <li>• \$190 heat, health and nutrition</li> </ul>
Cost of routers (ex GST)	<ul style="list-style-type: none"> <li>• Coordinator \$790</li> <li>• Router \$702</li> <li>• Solar router \$1,320</li> </ul>	Base Station \$6,000
Software cost	Nil	Nil – annual fee includes software, support, upgrades
Installation costs	Approx. \$1,500	By quote. Most farms require one base station on a pole, so inexpensive
Ongoing license/support	Nil	\$7.50/cow/year Includes support Cloud access and storage Upgrades
Website	<a href="https://www.cowmanager.com">https://www.cowmanager.com</a>	<a href="http://moomonitor.dairymaster.com">http://moomonitor.dairymaster.com</a>
Contact person	Chris Kendall	Julian Bentley
Contact email	<a href="mailto:ckendall@wvsaustralia.com">ckendall@wvsaustralia.com</a>	<a href="mailto:jbentley@dairymaster.com">jbentley@dairymaster.com</a>
Contact Phone	0427 487 743	0408 105 823

# Raising Heifers for Lifetime Productivity

Ian Bradshaw

Cattle Veterinary Services, Busselton WA

## Executive Summary

Raising replacement dairy heifers is an integral part of all dairy farm systems in WA. Dairy farms invest significant resources on genetic improvement that will not be fully realised unless heifers are managed to maximise this return on investment.

Previous research and observations of heifer growth rates in WA suggest there is room for improvement on some farms, and all farms should monitor heifer performance against industry KPI's.

Effective weaning, achieving target mating and calving weights, and managing the transition period into the lactating herd are all necessary for heifers to reach their potential in the herd.

Dairy managers need to understand the nutritional principles of successful weaning, establish target weights at mating and 1<sup>st</sup> calving, based on actual mature cow weights and breeding objectives of that herd, manage heifers to achieve target weights, and ensure heifers experience a smooth transition to the lactating cow herd.

This paper describes the key risk areas for heifer development that dairy managers can focus attention on to ensure heifers fulfil their productive potential.

Raising replacement dairy heifers is a significant part of any dairy business and accrues significant cost before income is realised on this investment in farm resources. When it comes to heifer raising, arguably farmers goals will be varied, from raising heifers as cheaply as possible, increasing income from surplus stock sales, maximising fertility, improving herd genetics, increased voluntary culling, to maintaining or growing herd size. Ultimately, the goal of raising replacement heifers is to build and maintain a herd of productive, healthy animals with high lifetime productivity and profitability. Dairy farms invest significant resources on genetic improvement that will not be fully realised unless heifers are managed to maximise this return on investment.

This paper may not contain especially innovative or new ideas, rather it highlights some areas where farmers can focus their efforts to achieve improved heifer performance. The potential benefits of maintaining focus on heifer management is based on the following observations;

1. The Western Dairy extended lactation study published in 2009<sup>1</sup> identified several herd demographics in WA that are suggestive of room for improvement in performance of replacement heifers. Data from some 270,000 1<sup>st</sup> lactations from 1991-2005 indicate important areas of sub-optimal 1<sup>st</sup> lactation performance. These include;
  - Average age at calving was approximately 31 months. **(this is now more likely closer to 28 months now)**
  - 1<sup>st</sup> lactation milk production is 78% of mature cow production (305 day yields), compared to industry accepted KPI at 85% of mature cow production.
  - 22.5% of 1<sup>st</sup> lactations end prematurely (<260 days in milk), indicating a high number of 1<sup>st</sup> calvers experience poor production or health outcomes, resulting in early drying off, culling or deaths.
  - 22.5 % of 1<sup>st</sup> lactations are extended (>350 days in milk), indicating poor reproductive performance in some 1<sup>st</sup> lactation heifers is common.
2. Our clinical impression based on observing replacement heifers on many farms in WA (Our own clients and live export heifers) is that there is wide variation in management practices for heifers between farms and subsequently a wide range of performance from weaning through to calving in WA. In particular;
  - Heifers are at high risk of poor growth rates during summer and autumn
  - Typical mating weights often do not reflect appropriate targets considering the mature cow size and genetic potential of many herds in WA.

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<sup>1</sup> The occurrence and production characteristics of extended lactations in Western Australian dairy herds. White C, and Rosher P, Dairy Australia 2009

3. The impact of heifer performance on herd dynamics and production is often underestimated.

- Herd structure is heavily biased towards young cow, and farm milk production is dominated by production from young cows. (52% of cows in herds in the EL study were 1st and 2nd lactation cows, producing 48% of total milk production.)
- Herd retention and culling rates are driven by availability of replacements, involuntary culling, and longevity of cows.
- Calving pattern of the herd is most easily managed by planned heifer calving's.

For raising 'ideal' replacement heifers the following periods are critically important in producing heifers capable of meeting their genetic potential in the herd.

These periods are;

- Weaning phase (2-6 mths)
- Meeting target mating and calving weights (6 -22mths)
- 1<sup>st</sup> Calving transition phase (22mths+)

In each phase the risks are different, although broadly centred on the nutritional management of the animal. The consequences of suboptimal management are also different, although interconnected, and ultimately have substantial impacts on heifer wastage, 1<sup>st</sup> lactation milk yield, risk of poor health outcomes, culling and longevity in the herd.

## The Weaning phase (Transition from pre-ruminant to ruminant digestion)

Weaning involves the animal transitioning from a milk based diet and pre-ruminant digestion where nutrients are largely supplied by direct acidic digestion in the abomasum (true stomach) to a plant based diet and ruminant digestion based on microbial fermentation in the rumen. (*From internal combustion engine to home brew kit on legs*).

This is a gradual process, and takes months to occur in nature, as a calf suckles large volumes of milk initially and starts ingesting high quality, low fibre pasture as its energy needs increase and milk production decreases in the cow. Eventually the calf is capable of eating large quantities of lower quality forage and meeting all of its needs through microbial fermentation and ruminant digestion.

In most dairy calves this is a greatly accelerated process based on using starch in cereal grains to initially stimulate rumen development and microbial fermentation. As calves start to eat cereal grains, volatile fatty acid's produced by microbial fermentation stimulates rumen papillae and expansion of the rumen. Initially fibre in the form of forage is not necessary for development of the rumen, the calf is eating a high energy and protein diet, and feed conversion efficiency is higher than at any other time in the animal's life.

Eventually the rumen must adapt to a forage based diet and this requires anatomical developments in each of the four stomachs to function as a ruminant. The rumen needs to grow in capacity and muscularity to hold and mix forage, as well as expelling gases produced by fermentation back up the oesophagus. The reticulum must be able to direct food into the rumen for fermentation, back into the mouth for cud-chewing, or into the omasum, on its way to the abomasum and small intestines for digestion. The omasum needs to develop a large surface area of 'leaves' to increase fluid and electrolyte resorption before sending nutrients into the abomasum for acid based digestion.

Development of a fully functional ruminant system takes months for structural development in these organs, and requires first a milk based diet for simple, acid based digestion, then fermentation of carbohydrates to stimulate rumen expansion and lastly exposure to fibre particles to stimulate many of the structural changes that will allow the ruminant to digest a forage based diet. Significant forage digestion does not occur until the rumen environment stabilises rumen pH above 6.0 and can sustain a healthy population of forage digesting microbes. In well managed calves this will not occur until 10-14 weeks of age.

Calves need gradual management through weaning, with increasing intakes of a starch based, high energy, high protein supplement, **and** exposure to fibre to complete development of the forestomach organs. Calves do not need access to fibre for several months after birth and can start the development of rumen function on concentrates alone, **but** a calf is not weaned until milk feeding stops **and** the calf is capable of digesting forage as an essential part of its diet.

- Supplement calves with a high protein, cereal based, balanced grain mix from shortly after birth. Access to forage should be limited.
- As a general guideline, minimum weaning weight should be 75kg, calves should be eating at least 1kg per day of starter ration, increasing in body condition and growing at a minimum of 0.75 kg/day.
- Weaning strategies need to be matched to the pre-weaning management (milk allowance, pre-weaning diet, age and growth rate at weaning) that suits each enterprise, which ultimately depends on calving pattern, rearing facilities, labour, available milk volumes.
- Poorly managed weaning results in calves with slower development of a functional rumen, with calves developing a poddy appearance, retarded growth and poor body condition.
- Feed conversion efficiency can be very high post-weaning (double that of a yearling), so this period is the most effective time to preferentially feed younger, lighter heifers and set them up to achieve target mating weights later on.

## Meeting target mating and calving weights

Generally accepted benchmarks for **minimum** target weights at mating are 55% of mature cow weight, and 82% of mature cow weight at 1<sup>st</sup> calving. One of the problems is that there is significant variation in mature cow weights, and in WA these are often much higher than commonly quoted or used by industry. There is a need to measure mature cow weights in WA herds and re-define what is 'normal' for individual herds. ***In the case of Elgin Dairies herd, a small sample of springing heifers and mature cows indicates average mature cow weight is around 730kg in this herd***

Herds need to benchmark their own mature cow weights and define heifer target weights based on their own data and genetic merit. Mature cow weights should be based on 3<sup>rd</sup> lactation and older cows in pre-calving body condition (4.5-5.5)

The goal of a target mating weight is to optimise reproductive performance of heifers. Heifers should be within the range of **55-60%** of mature cow weight at mating to achieve good reproductive performance.

The goal of a target 1<sup>st</sup> calving weight is to ensure production and fertility of young cows is not affected by excessive nutrient partitioning for further growth. Well grown heifers should calve in the range **of 80-85%** of mature cow weights and produce 85% of mature cow production in their first year.

- Most Holstein heifers in WA will need to grow at between 0.75-0.9 kg/day to achieve these targets.

Much importance is placed on average age at 1<sup>st</sup> calving (calving at 24 months is most efficient for rearing costs and potential replacement rate), however the timing of heifer breeding (and hence calving) on overall herd calving pattern is of more practical significance. Conception rates and reproductive performance of heifers is much higher and more predictable than lactating cows, hence time of calving of heifers is the best tool available for farmers to manage their calving pattern, regardless of production system. In this context, some heifers may need accelerated growth rates, while some could be held in check to meet the target weights for that particular group of heifers.

Onset of puberty and reproductive performance of heifers is primarily a function of bodyweight and condition, rather than age, and heifers will not reach normal fertility until at least the 3<sup>rd</sup> cycle after puberty. Reproductive performance is more likely to be affected by the 'tail' of the mob, rather than the 'average', hence the monitoring weights of lighter animals in the group is more important than the average.

In WA heifers are particularly at risk of poor growth rates in their first summer/autumn. Return on investment for supplementary feeding in heifers is high, because feed conversion efficiencies are higher at a younger age, however the labour, machinery and logistics of supplementary feeding heifers is more challenging. Farms need to consider the nutritional needs of each group of heifers and what options are available to supply them efficiently.

- Weaner heifers need a high energy, 16% crude protein diet and are incapable of digesting large amounts of lower quality forage at this age. These heifers will not achieve target growth rates without supplementation with 2-3kg/day of a high protein supplement.
- Yearling heifers require a high energy, 14% crude protein diet and are unlikely to maintain growth rates or acceptable body condition without some strategic supplementation. These animals should be weighed regularly and feeding adjusted to ensure they meet target mating weights when required.

Many herds rely on compensatory growth in winter and spring to make up for lower quality feed available in summer/autumn. Growth rates below 0.5kg/day for an extended time are difficult to make up later, while growth rates in excess of 1kg per day, or diets with insufficient protein, can have detrimental effects on udder development in unmated heifers.

As a rule of thumb;

- Monitor target weights rates strategically over summer/autumn
- Feed appropriate levels of protein for each age group to ensure lean body growth
- Avoid extremes of growth rates (too fast, too slow)

Pregnant heifers are usually easier to manage as they can meet their nutritional needs on a lower quality, forage based diet more easily than younger heifers. Pregnant heifers still need to be monitored and fed to meet their target weights through to calving. There is limited evidence that different growth rates at different stages of gestation have an effect on calf size, and no evidence that high growth rates have a detrimental effect on udder development after puberty, so arguably there is more flexibility to manage nutritional setbacks and compensatory gain when feed is available. Heifers should never experience weight loss, and managers need to be mindful that although compensatory gain can be used to make up shortfalls, feed efficiency declines with age, so cost of gain can be higher in older animals.

Milk yield, energy balance and fertility of 1<sup>st</sup> and 2<sup>nd</sup> Calvers is affected by weight at 1<sup>st</sup> calving, relative to their mature weight, as these animals continue to partition nutrients (energy and protein) towards growing to their eventual mature size. Under-grown heifers will take longer to reach their mature weight, and often will stop growing before they reach their genetic potential for frame size.

## 1<sup>st</sup> Calving transition

Transition management (4 weeks pre-calving to 4 weeks post-calving) is increasingly recognised as having very significant impacts on health, fertility and production. In the cow herd, nutritional management has centred on controlling the risk of milk fever, ketosis and other metabolic problems during the transition period for mature cows, and this period is a focus of significant research for new products and nutritional strategies.

First calving heifers face unique challenges and higher risks of health problems if not managed through this period. These challenges include;

- Calving for the first time, with increased risk of calving problems such as excessive trauma or nerve damage of the birth canal and hind limbs.
- Significant social challenges as heifers are introduced to older, dominant cows
- Sudden adaptation to the milking routine, walking on concrete yards, laneways and farm tracks, grain feeding in the dairy and competitive grazing or feeding in troughs and hay feeders alongside bigger, dominant cows.
- Sudden changes in diet to relatively unfamiliar feeds and feeding strategies (slug feeding, high cereal grain diets, by-products, rumen modifiers, strip grazing etc.)
- Continuing nutritional demands for growth, in addition to lactation.

Transition diets, particularly using anionic salts and other lead feeds, have become the mainstay of springer cow management over the last several years. While these have obvious and easily measured benefits to lactating cows through control of milk fever, the benefits for 1<sup>st</sup> calving heifers are not so obvious, although heifers are at risk of sub-clinical hypocalcaemia and the post-calving diseases (ketosis, RFM's, lameness, LDA's etc.) associated with poor calcium homeostasis at calving.

Lead feed diets are not detrimental to heifers although an increased risk of mastitis or udder damage through pre-calving udder oedema can be a problem. Udder oedema is more severe in heifers as the increase in blood flow to the udder occurs more quickly in heifers as they spring-up and blood vessels in and around the udder are smaller, less elastic and less developed than cows. Effective prevention is poorly understood, although pre-calving diets that limit energy and potassium are beneficial, as is ensuring adequate trace elements and vitamins, especially Vitamin E.

Importantly, 1<sup>st</sup> calving heifers need exposure to cereal grain pre-calving to start rumen adaptation to the lactating diet. Rumen flora take several weeks of increasing amounts of grain to adapt to higher carbohydrate diets and stabilise rumen pH, so there are conflicting demands between rumen adaptation, and excessive udder oedema in 1<sup>st</sup> lactation heifers. In general though, gradual introduction and limited quantities (2-3kg) of cereal grain pre-calving will not pose excessive risk of udder oedema and will significantly improve grain adaptation post-calving. Herds with significant problems with udder oedema need a thorough analysis of all components of the diet to identify risk factors that may be corrected. Heifers with severe udder oedema, or leaking milk should be milked prior to calving to reduce the risk of mastitis.

Rumen adaptation continues post-calving, and takes longer in heifers than cows, as they have more variable intake and often lower forage intake than cows. Grain levels should be stepped up more gradually and heifers need to be monitored more carefully for signs of ruminal acidosis. 1<sup>st</sup> calvers are more prone to variable feed intake caused by disease, mastitis, lameness, stress and competition for feed, and thus secondary problems such as acidosis and LDA's

The effect of changes of the herd social structure and environment on nutrition of 1<sup>st</sup> calvers should not be underestimated. Heifers have usually had minimal, if any contact with mature cows and prior exposure to mature cows either in the dry paddock, or springing paddock is likely to be beneficial for heifers in learning how to behave and compete with mature cows in a bigger herd environment. Cows have complex social interactions and heifers are at very high risk of bullying and other social problems when introduced to the herd.

## Summary

Heifer management is often a secondary priority for dairy managers, particularly when that return on investment is 1-2 years down the track, however every dairy herd has underlying health, production and fertility traits that were directly influenced by many aspects of heifer management.

Young cows make up a high proportion of dairy herds and ensuring cows meet health, fertility and production targets in their first lactation is essential to herd productivity.

Dairy managers have limited options to improve the productivity of cows already in the herd, however the management of replacement heifers offers the greatest opportunity to strategically plan calving patterns, and improve health, fertility and productivity of the herd over the medium term (2-5 years).

The genetic potential of dairy herds will not be realised unless heifers are managed accordingly to achieve these goals.

## Resources for Dairy farmers

Dairy Australia has a number of resources available through their website

- This includes an excellent publication ***'Heifers on target – A guide to growing more productive heifers'***, and an online calculator that helps you establish a target growth chart for your herd, assess average weights of heifers quickly, and calculate likely growth rates on a given diet.

<http://dairyaustralia.com.au/Animal-management/Fertility/Heifer-management>

Penn State University has a spreadsheet that you can download.

- This calculator allows you to plot individual weights against a target growth chart customised to your herd.

<http://extension.psu.edu/animals/dairy/nutrition/heifers/monitoring-heifer-growth/customized-dairy-heifer-growth-chart/customized-dairy-heifer-growth-chart-spreadsheet>

For more specific advice about weaning and transition management of replacement heifers, dairy managers should consult their nutritionist or veterinarian.

# Soil pH and pasture dry matter responses following two different methods of lime application at varying levels in south-western Australia

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## Summary

A plot experiment was conducted on an acidic (pH 4), sandy soil over a 3-year period in south-western Australia to determine the effect of liming rate (0, 1.3, 2.6, 3.9, 6.5 and 13 t/ha) and application method (top-dressed with or without soil cultivation to 10 cm) on soil pH and pasture yield. Mean soil pH (0-10 cm) increased significantly with increasing rate of lime application, but only on plots where lime was mixed into soil; on plots where lime was applied to the surface soil pH was unaffected by lime. Pasture production was measured in two growing seasons (2011 and 2013) and was unaffected (mean = 7,331 kg DM/ha;  $P = 0.60$ ) by lime application rate, but was significantly affected by soil cultivation (7,526 v 7,136 kg DM/ha;  $P < 0.001$ ). In conclusion, increasing lime application changed soil pH when mixed into soil, but did not result in greater pasture production. More work is needed to develop better ways to predict when lime application will be cost effective.

## Introduction

Soil type in the dairy regions of Western Australia (WA) are mainly sandy, with occasional sandy loams also present throughout the area. Soil acidification in the region has intensified with increasing agricultural activity, resulting in many soils having pH levels of approximately 3.7-4.5 in calcium chloride ( $\text{CaCl}_2$ ; Bolland and Russell, 2010). Current recommendations for lime applications on dairy pastures in WA target soil pH levels of 5.5 to avoid limitations to pasture production, however these targets are based on limited local research. Furthermore, pasture production responses to lime applications in WA have been inconsistent, and appear to be affected by soil type, with greatest responses being observed in sandy loams and minimal yield responses observed in sand or sandy gravel soils (Bolland et al 2002). Application of lime to agricultural land can be done two ways, by surface application or by incorporating lime into the topsoil. Dairy farmers in WA tend to favour surface application of lime due to the negative effects of incorporation on soil structure. This study was conducted over a three year period at Vasse Research Centre (VRC), and aimed to (a) test whether there was a difference in pH and pasture responses to applied lime using surface vs. mixed application, and (b) quantify soil pH and pasture yield responses to increasing levels of applied lime.

## Materials and Methods

The experiment was conducted over three growing seasons (2011-2013) in a paddock at VRC (33°45'S, 115°21'E, elevation 30 m), approximately 15km south of Busselton in south-western Australia. Soil in the area is 1-2m sand to sandy loam over massive clay, which is known locally as Abba sand (Tille and Lantzké 1990), and classified as Chromosolic Redoxic Hydrosol (Isbell 2002) and Glossic Natrudalf (Soil Survey Staff 1987). Total rainfall in 2011, 2012 and 2013 at VRC was 804, 678 and 918 mm respectively. Pre experimental soil testing of the paddock (CSBP laboratories, Kwinana) in February 2011 to a depth of 0-10 cm showed the paddock had a mean pH of 4.0 ( $\text{CaCl}_2$ ), a phosphorus buffering index of 39, an organic carbon content of 3.8%, and Colwell phosphorus (P) and potassium (K) levels of 27 and 156 mg/kg respectively. Forty eight plots were used in the experiment, each measuring 5 x 5 m. Lime was applied once at the start of the experiment on 13 April 2011. Experimental design was a 2 x 6 factorial, with six rates of lime application (0, 1.3, 2.6, 3.9, 6.5 and 13 t/ha) and two methods of lime application (top-dressed with or without soil cultivation to 10 cm). A randomised block design was used to assign each treatment to plots. Following season-opening rains, ryegrass seed (*Progrow*) was broadcast every year on each individual plot. Pasture was harvested mechanically from each plot to 5 cm above ground level using a ride on lawnmower at the 3-leaf stage. This resulted in 5 different harvest dates in 2011 (July – November), 5 different harvest dates in 2012 (May – October) and 6 different harvest dates in 2013 (June – November). Due to resource and budgetary constraints, individual DM yield was only measured from each plot in the 2011 and 2013 growing seasons. Pasture DM production per hectare from each plot was calculated by multiplying the total weight of dried pasture collected from each plot by 625.

Basal fertilisers nitrogen (N), K, and sulphur (S) were applied after all pasture harvest events, apart from the final harvest each growing season, and P was applied annually, to ensure pasture production was not limited. Soil samples were collected on ten different occasions at two depths (0-10 cm and 10-25 cm) in the period between 7 April 2011 and 14 May 2014, and analysed for

pH in CaCl<sub>2</sub> (Rayment and Higginson, 1992). In addition, a soil sample from the eight plots that received nil lime was taken on 13 May 2011 and analysed to determine total cation exchange capacity (CEC) and the proportion of exchangeable aluminium (Al), K, sodium, calcium and magnesium in total CEC. Data were analysed in Genstat (GENSTAT release 17, VSN International, Hemel Hempstead, UK) using individual plots as replicates, where lime application rate and method were considered as main effects. Significances were declared at P < 0.05.

## Results

Figure 1 illustrates the soil pH responses to applied lime (data shown are means of 2011-2014 soil tests). Lime application had no effect on soil pH from 10-25 cm, regardless of application method (P > 0.10). However, at soil pH 0-10 cm, there was a highly significant interaction detected between.

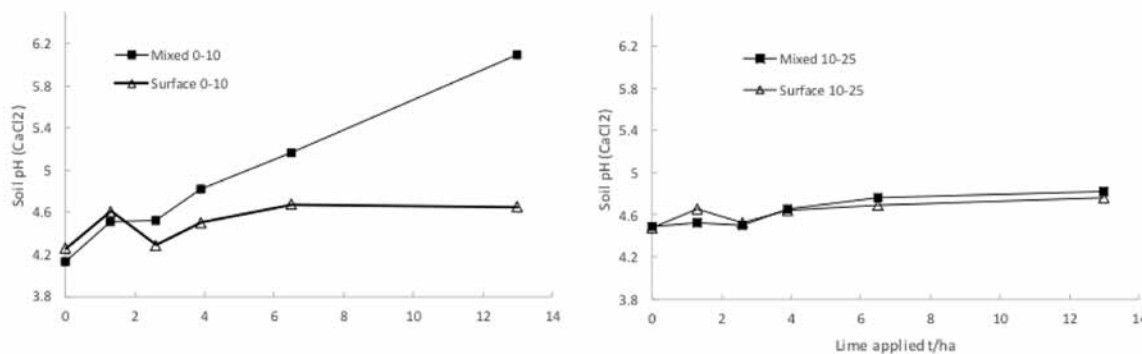
**Table 1: Pasture production responses to applied limestone in south-western Australia**

	Lime treatments						5% L.s.d.	P-Value
Application rate (t/ha)	0	1.3	2.6	3.9	6.5	13		
Pasture yield (kg DM/ha)	7,096	7,356	7,356	7,427	7,357	7,393	390	Not sign
Soil cultivation	Nil		Mixed to 10 cm					
Pasture yield (kg DM/ha)	7,136		7,526				225	<.001
Year of harvest	2011			2013				
Pasture yield (kg DM/ha)	6,858			7,804			225	<.001

P<0.001 is highly significant

application rate and method (P < 0.001), whereby soil pH increased with increasing lime application, but only on the plots where lime was incorporated into the topsoil.

Pasture yield responses in 2011 and 2013 to applied lime are shown in Table 1. There was no effect of lime application rate (P = 0.60) on pasture yield. Pasture production was highly affected by year and soil cultivation, being greater in 2013 than 2011 (7,804 u 6,858; s.e.d. = 113, P < 0.001) and was greater on plots that had been cultivated us those that had not been cultivated (7,526 u 7,136; s.e.d. = 113, P < 0.001).



**Figure 1: Soil pH responses at two different soil testing depths to applied limestone in south-western Australia between 2011 and 2014.**

## Discussion

On the majority of plots in both 2011 and 2013 soil pH was significantly lower than 5.5, the level recommended to avoid adverse effects of soil acidity on pasture production (Bolland et al 2002). Incorporation of lime into the topsoil resulted in an immediate increase in pH, which is in agreement with Yeates et al (1984). A marginal increase in pasture yield was also observed on INC plots. However there was no negative effect of low soil pH on pasture yield detected, as the rate of lime applied had no effect on pasture yield. Typically, reductions in pasture production on acidic soils are mainly caused by the increase in solubility of Al, which is toxic to the roots of many plant species at excess levels. However, the manganese (Mn) and organic carbon contents of the soil can also affect plant health in acidic soils because high, potentially toxic, concentrations of Mn are also released as acidity of soil intensifies, while greater levels of organic carbon help counteract this by binding more Al and Mn in a non-toxic form (Havilah et al 2005). Limited analysis of the exchangeable Al content of the soil was conducted in this study, but testing of the nil lime plots in May 2011 approximately one month after lime application, indicated the proportion of Al on soil cation



exchange sites was 13%. Slattery et al (1999) suggested that Al-tolerant species such as annual ryegrass could remain unaffected by proportions up to 30%, potentially providing an explanation for the lack of yield responses observed here. In conclusion, it appears liming management decisions in WA should not be based solely on soil pH, but should also consider the exchangeable Al content, and possibly organic carbon and Mn levels, so as to avoid unnecessary expenditure on lime by producers. Further work is required across a number of sites in the region to define pasture and soil chemical changes to applied lime, in order to develop a multi factorial index to assist with management of soil acidity, to better predict when lime application will be cost effective in ryegrass-based dairy pastures.

## Acknowledgement

This work was funded by Dairy Australia and the Department of Agriculture and Food Western Australia.

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# Optimising dairy calf nutrition and performance

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Pre-weaning growth of calves is the most expensive period of growth an animal will undergo in its lifetime. Traditionally, it is recommended to provide calves with approx. 10% of bodyweight (4 – 4.5 litres/day) in milk or milk replacer for the first few weeks of life. Importantly this is less than a calf would naturally receive if left suckling with its mother, where they would generally consume 8-10 litres/day in the first 3-4 weeks of life. The theory behind this strategy is that restricted feeding of milk will accelerate rumen development and function, and intake of solid feed.

Successful calf rearing should target an average daily gain (ADG) of 0.7 kg/day, which equates to a target weight of approx. 100kg at 12 weeks of age (for a 40kg calf at birth). However, recent data suggests it is very difficult to achieve this under conventional feeding practices. Restricted milk provision, especially in the first 3 weeks of life, generally results in lower growth rates, increased susceptibility to stress and disease and higher mortality levels. This is why concentrate provision is critical in early life.

Calves should have access to concentrates within 3-5 days of age, to assist rumen development and function. It should contain approx. 17% crude protein, have a high energy density (> 13.0 MJ/kg) and be somewhat coarse in nature, to maintain rumen papillae in optimum condition. Unlimited access to clean drinking water is essential, and a limited amount of good quality fibre is also important as concentrate intake increases. However, large amounts of poor quality hay or straw will reduce the energy density of the overall diet, slow down growth rates and can often result in an undesirable "pot belly" condition.

Weaning is a very stressful period for calves and the age of calves should NOT be the sole criteria determining weaning date. Instead a solid feed intake of approx. 1.4% of bodyweight (minimum of 1kg DM/day solid feed) should be targeted before gradual removal of liquid feed over a seven day period. Poorly functioning rumens at weaning will stunt the growth rate of the calf post-weaning regardless of how they performed pre-weaning; hence adequate intake of solid feed pre-weaning will help reduce this effect and improve health and wellbeing of the calf.

Accelerated feeding is an alternative feeding strategy that has received significant research interest in recent years. This involves providing higher amounts of milk or milk replacer in the first 4 weeks of life, (15-20% of bodyweight or 8-10 litres/day for an average calf), before stepping down to conventional levels from approx. 5 weeks of age until weaning. This results in a higher ADG, but slower rumen development in the first 4 weeks due to reduced solid feed in this period. However data has shown if this strategy is managed correctly through weaning and post weaning, calves will have a higher bodyweight at 12 weeks of age (115-120kg).

The benefits of this strategy include calves being able to express more natural feeding behaviour, reduced signs of hunger, improved growth and improved health and welfare. Longer term benefits of higher growth rates in heifers pre-weaning include a reduced age to first calving, plus a recent review of 12 experiments showed that first lactation milk yield increased by 155 kg of milk for every additional 100 g of pre-weaning ADG as heifers. Accelerated growth rate feeding results in increased costs in terms of extra milk consumed, but so far, data indicates that the long term benefits to the animal more than compensate this, although it is a topic of ongoing research.

We are not advocating one strategy over the other in this article, but we do recommend farmers aim to stick to the general rules of thumb outlined above in terms of target ADG, solid feed intake at weaning and the nutritional composition of solid feed offered to calves.

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# CLARIFIDE for Dairy by Zoetis

CLARIFIDE is a genomic selection tool that assists the identification of superior dairy heifers. Developed by scientists at the Dairy Futures CRC in collaboration with ADHIS and Australian industry partners, CLARIFIDE predicts the production, health and type potential of Holstein and Jersey heifers.

Selection of replacement heifers using CLARIFIDE allows you to achieve your breeding and business objectives by reliably identifying heifers of superior genetic merit. CLARIFIDE delivers the suite of genomic Australian Breeding Values - ABV(g) - and selection indices generated by the national dairy genetic evaluation at ADHIS.

A simple tail hair sample or ear notch is taken from heifers available for selection and the DNA information is combined with pedigree details to produce ABV(g). Heifers can be genotyped as soon as they are born and the information is then available to make selection, management and breeding decisions later in life. The ABV(g) information produced by a CLARIFIDE test is equivalent to recording a cow over seven lactations (or in the case of bulls, having 35 daughters recorded).

To take your breeding decisions to the next level – contact your local Zoetis Sales Representative or Genetics Customer Service on [genetics.au@zoetis.com](mailto:genetics.au@zoetis.com)

Zoetis are proud to be part of Dairy Innovation Day; as well as Clarifide, find out about the leading range of reproductive vaccines as well as teatseal and other dairy specific products at the Zoetis tent.

# App puts good bulls at your fingertips

Building on the popular Good Bulls Guide, the new Good Bulls app makes it easier than ever for dairy farmers to identify bulls that match their breeding priorities.

Drawing from an expansive database of local and international dairy bulls, the Good Bulls App allows bulls to be sorted on Australia's three breeding indices: Balanced Performance Index (BPI), Health Weighted Index (HWI) and Type Weighted Index (TWI).

Up to 50 filters can be used to find bulls that match your breeding objectives. Bulls can be filtered by any trait (e.g. protein, cell count, fertility or mammary system) or by semen company, pedigree, genetic characteristics and other factors.

The app provides detailed ABVs on each bull making it easy to compare between bulls and shortlist bulls of interest. Shortlisted bulls can be exported to a trusted advisor to facilitate semen purchasing decisions.

Dan Knee, who milks 400 cows at Toora, Vic was one of the test users in the app development. "The App is great. It makes it quicker and easier to identify bulls with the traits that are important to me. It has turned a job that once took hours into a simple, fun task," he said.

Sarah Saxton, from the Australian Dairy Herd Improvement Scheme (ADHIS), said the app would be updated twice a year with the April and August release of Australian Breeding Values (ABVs).

The app is available for both iPhone and Android phones and can be used on tablets.



# Western Dairy - DairyNote

## Issue 1.1 2016

### *Business Improvement and Innovation (BII) – A case study in pasture management through the 2014 and 2015 winter spring season on a Brunswick dairy farm in WA*

Continually identifying opportunities and reviewing current practices to achieve greater profitability and sustainability is a key component of successful dairying. The business improvement and innovation process identifies key areas where gains can be made as well as management pathways to achieve these gains.

This case study data was recorded on a Brunswick dairy farm from the winter/spring season of 2014 and 2015. The farm was identified as having the potential to improve feeding efficiency.

### Case Study: 2014

In the 2014 season increased focus was given to grazing annual ryegrass at the three-leaf stage and to making adjustments to grain allocation in response to pasture dry matter (DM) allocations. Monitoring DM intake through the autumn/winter season is important as pasture growth rates change, and availability of pasture increases. The average cost of a kilogram of pasture DM can be up to 4 times lower than a kilogram of grain DM, depending on the type of grain used. Therefore reducing grain intakes as more pasture becomes available will increase margin over feed costs at a time of the season when milk prices are lower.

A quick way to evaluate the cost of your ration is to calculate a margin over feed cost (MOFC). To calculate a MOFC you subtract the average daily cost of your feed per cow from your milk income per cow.

- Milk income = litres/cow/day x price per litres in cents.
- Av. Daily cost of feed = sum cost of all daily feed ingredients/cow (pasture, grain, silage, hay, etc).

The aim is to get the largest difference as possible between the cost/cow and income/cow.

The following tables show the MOFC for this farm's analysis:

**Table 1. MOFC of high grain ration.**

Au. Daily milk yield	25 litres/cow
Au. Daily grain fed	7.5kg wet/cow
Cost of grain	\$530/t wet
Est. pasture eaten	12.5kg DM/cow
Cost of pasture	\$130/t DM
Au. Daily feed cost	\$5.60/cow/day
Milk income @43c/l	\$10.75/cow/day
MOFC	\$5.15/cow/day

**Table 2. MOFC of low grain ration.**

Au. Daily milk yield	25 litres/cow
Au. Daily grain fed	5.5kg wet/cow
Cost of grain	\$530/t wet
Est. pasture eaten	14.5kg DM/cow
Cost of pasture	\$130/t DM
Au. Daily feed cost	\$4.80/cow/day
Milk income @43c/l	\$10.75/cow/day
MOFC	\$5.95/cow/day

This represents a 16% increase in daily MOFC and for 100 cows over a 3 months would see an extra return of \$7,200.

### Case Study: 2015

In 2015 the decision was made to assess pasture dry matter accumulation in 4 paddocks to get an idea of the relative performance of the paddocks.

In this study a poorly performing irrigated paddock (PI), a poorly performing dryland paddock (PD), a better performing irrigated paddock (BI) and a better performing dryland paddock (BD) were plate metered approximately every 10 days from early June to early October. In addition ryegrass leaf stage was assessed and from that, leaf emergence rates were calculated. The better performing dryland paddock (BD) was pasture sampled at three intervals through the season. The relative paddock performance was based on the farmer's judgment.

Of the four paddocks BI and BD were sown with SF Speedyl annual ryegrass, PI was drilled with SF Speedyl and was water logged for most of the winter and PD was sown to perennial ryegrass but also drilled with SF Speedyl. Paddock PD appeared to be affected by soil compaction.

A basic rising plate meter was used to determine pasture mass. Pastures mass was calculated using equations based on annual ryegrass formulated at the Vasse Research Centre. The equation reflects the changing nature of the ryegrass plant at stages in its seasonal growth pattern. There is a reasonable margin of error when using a rising plate meter, approximately 200kg DM/ha as reported by scientific literature, but it is a good indicator of pasture biomass and a widely accepted method of measuring pasture dry matter.

The plate meter data for the 4 paddocks is show below in table 3.

**Table 3. Pasture Biomass in the 4 paddocks (t DM/ha)**

	July	August	September	October (10 days)	Total
BI	0.67	0.98	1.35	0.10	3.10
PI	0.47	0.87	1.18	0.26	2.77
BD	1.65	2.30	3.10	0.67	7.71
PD	0.84	1.95	1.46	0.78	5.03

Grazing at or near the three-leaf stage for annual ryegrass maximises dry matter accumulation and is vital to optimise financial returns of feed in the winter/spring seasons. The quality of annual ryegrass typically found in late winter and early spring when supply exceeds demand is such that a reduction in grain feeding, coupled with increased pasture allocation will generally not have a negative effect on milk production. The exception here is when feeding high yielding cows in early lactation, and farmers should discuss rations for these high yielding cows with their nutritionist.

Annual ryegrass in late winter, early spring and mid spring has crude protein (CP) levels well in excess of animal requirements and farmers should look at feeding grain supplements with lower crude protein concentrations. Lactating dairy cows typically require 16-18% CP in the diet, and early and mid- season annual ryegrass can often contain CP levels over 30% (see Table 4).

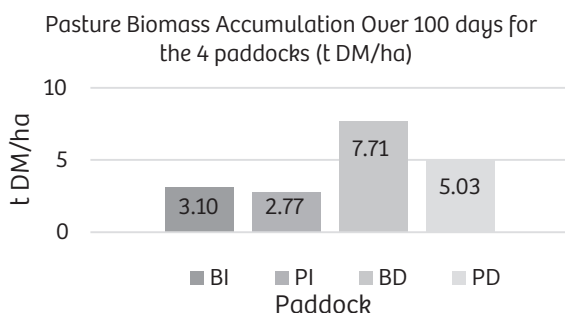
**Table 4. Pasture test results from the better performing dryland paddock (BD).**

	15/07/2015	14/08/2015	7/10/2015
DM %	10.4	8.7	16.
7 ME (MJ/kg DM)	12.8	11.0	11.7
CP %	31.5	27.4	22.9
NDF %	42.6	48.7	48.4

Therefore when annual ryegrass constitutes the majority of the diet, it's highly unlikely that dietary protein levels will be limiting milk production.

As ryegrass matures, CP levels drop and fibre levels increase, so there may be merit in introducing a CP based grain later in the season. Regular testing of pasture will help inform this decision. Limiting the use of CP based grains should improve MOFC as these are generally cheaper supplements.

Identifying poor performing paddocks and renovating these to addressing the constraints of poor growth is important. Increasing dry matter yields of paddocks should justify the cost of renovating. Irrigated paddocks do appear to have some issues that impact on pasture growth in the winter and spring months, as seen in this case study, and there is a tendency for these paddocks to be waterlogged over winter and early spring.



**Figure 1. Pasture Biomass Accumulation over 100 across the 4 paddocks (t DM/ha)**

This study revealed that a reduction in grain during the winter-spring months when more pasture DM was available would not negatively affect milk production, as pasture CP is high at this time of year and, reducing the amount of grain fed will also increase the MOFC for the ration. It also showed that dryland paddocks produced more pasture biomass over the winter spring season in comparison to irrigated paddocks (see figure 1.)

# Western Dairy - DairyNote

Issue 1.2 2016

## Dairy Feedbase: Flexible Feeding Systems Experiment

Flexible Feeding Systems (FFS) is an ongoing research project looking at how to best integrate supplementary concentrates into a dairy feeding system.

The national FFS project commenced in Western Australia in 2012 and is funded by the Department of Agriculture and Food, Western Australia (DAFWA) and Dairy Australia/Western Dairy. The project is being undertaken in collaboration with Victorian researchers (FFS-Vic) and aims to investigate more efficient use of concentrates for dairy cows.

Improving the feed use efficiency of concentrates for milking cows is particularly important in our environment where concentrates and conserved forages make up a substantial part of the annual diet. Furthermore, concentrates are an expensive feed, so improved efficiency will aid in improving farm financial performance.



### FFS-WA: Phase 1 (2012-2013)

WA dairy farmers were actively involved in Phase 1 of the project, with feeding management practices intensively monitored on 13 partner farms from March 2012 to June 2013.

Two feeding systems were compared during this time:

- 1) The system where all concentrate is fed in the dairy parlour - separate from forage in the paddock and;
- 2) The system where concentrate is mixed together with forage in partial mixed ration (PMR).

It was expected, largely due to improved rumen health, that the PMR system would have higher milk production, leading to higher farm profitability. However, results failed to show any significant difference between the two systems.

### FFS-Vic

Findings from FFS-Vic are supportive in that no production benefits were observed when a simple PMR (pasture silage + barley grain) was fed over the traditional method of feeding all concentrate in the dairy. In WA it is common for PMR diets to only consist of two or three components, classifying them as simple.

FFS-Vic then went on to report that feeding a more complex PMR, including simple PMR components plus lucerne haylage, maize silage and maize grain, increased milk production by approximately 2 kg/cow/day.

In another similar experiment the researchers went on to find that increasing metabolisable protein supply above the recommended requirements by replacing some wheat with canola meal, and grass silage with lucerne haylage, increased milk production by 3-5 kg/cow.

### FFS-WA: Phase 2 (2015)

Based on FFS-Vic findings and as part of FFS-WA Phase 2, the DAFWA dairy team carried out a feeding trial at Vasse Research Centre from March 2015 to June 2015.

- 2) The trial compared two groups of early lactation cows each receiving 14 kg DM/day of a PMR mix, comprising 8 kg pasture silage and 6 kg of concentrates (DM basis).
- 1) The control treatment contained 6kg of crushed wheat only, while the experimental treatment contained a 6 kg mixture of canola meal, wheat and maize grain.

Both groups were provided with an additional 3.6 kg of lupins fed in the parlour, and also had unrestricted access to lucerne haylage in the paddock separately to the PMR mix.

## Results

Results showed that over the 12 week experimental period, the group receiving the complex concentrate mix produced 2.2 kg more of energy corrected milk than the group receiving wheat only in the PMR.

This was mainly driven by a greater voluntary intake of lucerne haylage (2 kg DM/cow per day) in the cows receiving the complex concentrate mix. This group also had a much reduced body condition loss, and a greater weight gain than the control group.



## Further Research

The next step is to determine the reasons for this apparent increase in appetite and intake in the cows receiving the complex concentrate mix. This will involve an *in-vivo* digestibility study using nylon bags and ruminally fistulated cows, to be conducted in Victoria in early 2016.

The contribution of maize grain to the positive effects of dry matter intake and milk yield observed at the Vasse Research Centre (WA) may be linked to the slower starch degradability profile of maize grain in the rumen. However this feed is not economically viable at current prices for WA dairy producers.

Therefore we are going to use the nylon bag experiment to help identify feeds of similar starch degradability to maize grain, that are more relevant and cost effective, to WA dairy producers. This will allow us to gain a greater understanding of the mechanisms behind the differences in intake and milk production observed in the experiment at Vasse.

For further information on this study, and other dairy related studies being undertaken in Western Australia contact the Western Dairy Research, Extension and Development Hub.

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# Western Dairy - DairyNote

Issue 1.5 2016

## Potassium Fertiliser for Ryegrass Pastures

### Key Messages

- In ryegrass dominant swards aim for a minimum potassium (K) content of 1.5% dry matter (DM) in plant tissue tests.
- Plant testing should take place at the three leaf stage, just prior to grazing.
- Soil testing for K is not a reliable indicator for DM responses in ryegrass.
- Aim for a minimum K content of 2% DM for clover tissue tests, as clover has a higher requirement for K.
- Potassium fertiliser should be applied with nitrogen and sulphur in multiple applications after each grazing.
- Potassium deficient ryegrass has a lower metabolisable energy content.

Dryland dairy pastures in Western Australia have traditionally comprised a mix of annual and/or Italian ryegrass with subterranean clover. However in recent years, intensification of dairy systems and increased usage of nitrogen fertiliser has led to a decline in the clover content of intensively managed pastures in the region.

Previous research has shown that clover is very susceptible to potassium deficiency, particularly in WA where the sandy soils are inherently low due to subsoil leaching. Therefore, management of pastures to ensure they are not limited by K availability is critical to ensure dry matter yields are maximised.

Soil testing for K deficiency is unreliable as the K content in soil is highly influenced by urine patches, therefore plant tissue testing at the 3-leaf stage is a much more reliable indicator of the K status of fresh pasture.

### The Potassium Trial

A three-year plot experiment was conducted at Vasse Research Centre to define the minimum critical K level required in the leaf tissue of annual and Italian ryegrass in order to achieve 95% of the maximum yield. The site was depleted of K for seven years, and plots were assigned various levels of K fertiliser, with all other relevant basal nutrients supplied to ensure K was the only limiting nutrient.

The results were very distinct and repeated in all years; at 1.15 to 1.3% K in the DM of plant tissue, 95% of the maximum potential yield was achieved. This is significantly lower than the 2% K requirement in DM of clover to avoid K deficiency, and indicates substantially less K fertiliser is required than earlier recommendations in ryegrass dominant pastures. No difference in the minimum K requirement of plant tissue was observed between annual and Italian ryegrass.

### Implications

Importantly, these recommendations apply only to farmers with ryegrass dominant pastures (greater than 90% annual or Italian ryegrass). For less intensive farmers, who still have a substantial level of clover in the sward, a K level of 2% DM in leaf tissue is still required to avoid a decline in the clover content of the sward. Potassium is an essential element to achieving high productivity from pastures; the experiment showed significant "mining" of K from the soil occurred over the 3-year period. Therefore, a close eye should be kept on the K content of paddocks cut for fodder, as removal of large amount of dry matter from paddocks can deplete K levels rapidly. Farmers should rotate sacrifice paddocks in the dry season to ensure nutrient recycling from animal faeces and urine is more evenly spread throughout the farm.

Muriate of potash is the most common fertiliser used to supply potassium to pastures. High levels of potassium can induced metabolic issues such as milk fever and grass tetany and therefore should be managed accordingly. It is recommended that potassium should be applied to dairy pastures after grazing in small (10-20 kg K/ha) and regular applications if required.

For further information contact the Western Dairy Research, Extension and Development Hub.

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# PGG Wrightson Seeds

*PGG Wrightson Seeds*

*Concord® II is a major development in Italian ryegrass with its exceptional speed of establishment combined with even seasonal growth.*

Concord® II diploid Italian ryegrass is the next generation Concord® which was the first proprietary ryegrass developed in Australia by PGG Wrightson Seeds.

Concord® II is an outstanding Italian ryegrass with exceptional speed of establishment, delivering increased winter production and solid seasonal dry matter production with the ability to carry through to the second year where conditions allow.

The speed of establishment of Concord® II allows for greater flexibility of the variety, allowing it to be used in many more situations than its predecessor. While traditional autumn sowing is the primary use of Concord® II, its speed of establishment allows it to be used successfully in over-sowing situations, pugged pasture recovery programmes, spring sowing where irrigation is available or where Italians have been used in a more annual sowing programme.

When used in an autumn sowing, the increased growth through the winter months is where Concord®II will return the greatest benefits to your farming situation by delivering excellent feed volumes to support grazing animals.

Another improvement that has been made with Concord® II is increased second year production which has been a trait that other Italian ryegrasses, coming to the market seem to have lost over the past few years.



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