THE UNIVERSITY OF SYDNEY

FACULTY OF VETERINARY SCIENCE

DAIRY RESEARCH FOUNDATION NEWSLETTER

Volume 7 - Issue 1, APRIL 2015

Prof. Yani Garcia
DRF Director and Dairy Science Group Leader

Mr Bill Inglis
DRF President

DIRECTORS' UPDATE

Welcome to the latest issue of the DRF Newsletter!

We are excited to see milk production in Australia going up and NSW accounting for the second largest increase after Tasmania! The whole of NSW is up by 5.4% compared to previous year, with the Inland/Central region up by 12%, showing the potential this State has to grow!

In line with this reality, how science can help farmers to grow their dairy farm business sustainably will be the focus of the 2015 Dairy Symposium to be held in Camden (16th June is the Dairy industry day and 17-18th June is the Dairy Symposium). Growth is also the focus of a new plan being developed by a 'Collaborative Industry Action Group' that involves all industry organisations, processors operating in NSW, NSW DPI and the DRF.

Read more about the symposium, research and postgrad students updates inside; and don't hesitate to send us your feedback..!

Regards Yani

FROM THE PRESIDENT

2014 was a year of many achievements! The Robotic Rotary dairy at Corstorphine was completed and is running well. Yani Garcia, Kim McKean, Kendra Kerrisk and their team deserve congratulations for this huge achievement. I also thank the University of Sydney and the Faculty of Veterinary Science for their support.

Of note is the high standard of research over the past year and the quality of the work being done by the postgraduate students. Former PhD student Helen Golder won the young agricultural Scientist of the Year for her work on acidosis in dairy cows. Alex John (PhD Student) recently placed third in the Australia National Student Awards. Congratulations to both Helen and Alex!

Regards Bill

THE DAIRY RESEARCH FOUNDATION'S

2015SYMPOSIUM

June 17 - 18, Camden NSW

THE UNIVERSITY OF SYDNEY

Be amongst the first in Australia to tour the innovative robotic rotary recently installed at the University of Sydney's Corstorphine farm

The Dairy Research Foundation's 2015 Symposium will include a seminar series on Day 1 at the Liz Kernohan Conference Centre.

As is customary, the day will be followed by the Conference Dinner.

Again, Day 2 means the ever-popular Emerging Scientist Program 'on farm' at Corstorphine. This will be the opportunity for you to inspect the robotic rotary and other research projects under way at the University of Sydney's Camden Campus.

Be prepared to be challenged and learn about things that can be put into practice at home with an immediate benefit.

The DRF is pleased to be collaborating with Dairy NSW, Dairy Connect and NSW Farmers' Association Dairy Section in the planning of NSW industry activities (Members' Council and AGMs) on June 16.

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2015 SYMPOSIUM

What does the program look like?

The importance of Growth is the underlying theme for the 2015 Symposium. Whether it be through science and technology or changes in feed or management systems, the growth potential of the dairy industry is extensive.

The Symposium Committee have amassed a brilliant team of speakers for 2015, headed by **Professor Ephraim Maltz** from the Agricultural Research Organization, Volcani Center of the Institute of Agricultural Engineering, Israel. Professor Maltz is an internationally acclaimed expert in technology application in systems that push the boundaries in terms of productivity per cow and per farm.

Associate Professor Ben Hayes from Dairy Futures CRC will be taking the audience through the latest blue sky innovations that have the potential to take the Australian dairy industry to the next level.

We know that farmers love to hear from other farmers speaking at our Symposium and we are very pleased to have procured a number of farmers from around Australia to share their stories of growth with the audience. **Neil Moss** of SBScibus will set the scene for our farmers in an introduction of the diverse pathways to growth he has experienced in different business models. The farmers will open your eyes to different growth models that you may not have considered previously.

James Walker is a grazier from Longreach Qld who runs a sheep and cattle property. James developed his own financial literacy and joins us to share his infectious passion for farming and **Rob Hortin** from Torbay in WA will talk about feeding systems strategies the family have put in place to aid in business growth and a summer productivity increase of around 40% with minimal changes.

Greg Heffernan, Bega Valley, NSW takes a more traditional approach to things focussing on investment in improved facilities as a farm management model with smart investment to succeed.

From the footy field to the farm paddocks—**Ian Hindmarsh** will reveal his family's spirit and determination in developing a 'greenfield' site in Cowra NSW to be a successful dairy and beef cattle farm.

2015 SYMPOSIUM
What does the program look like?

Ruth and Neville Kydd, Blighty NSW, are regular Symposium attendees and this year Ruth joins us as a speaker. They know first hand the importance of profitability during business growth and will impart some of knowledge of turning expenditure into revenue.

Farmers moving towards the latter part of a career are more frequently looking at automatic milking systems as an answer to growth by production efficiency. **Wayne Clark** from Casino NSW will share his experience with this progression.

Basil Doonan, Greg Mills, Ann Burbrook and **Heather Bray** all feature in the Day 1 session 'Making money and consumer connections'. Making money is always at the forefront of a dairy farmers mind but do we really know what a consumer wants and how to give it to them? This is a hot topic and will make for a very enlightening session at the Symposium.

Mike Logan, CEO Dairy Connect and Neil Lane of Dairy Australia discuss aspects of the industry quite pertinent to our farmer speakers stories, that is, developing exports markets and financial literacy.

The Symposium will continue its journey through automatic milking systems and a highlight of this will be the farm tour on Day 2.

Attendees will be exposed to some of the latest technology being tested on the University's dairy research farm, Corstorphine.

The highly anticipated Emerging Scientists Program will be a feature of the Day 2 program and once again we have post graduate students from around Australia showcasing their studies and vying to be the one who takes first place in the competition.

Hope to see you in Camden in June!

The **Dairy Research Foundation** now has a Facebook Page.

The DRF team feels that the time has come to join social media. We will be using this to support our research work, the Annual Symposium and any other major happenings within the world of dairying.

like us on facebook

The nutritive value of pasture ingested by dairy cows varies within a herd

Dr Cameron Clark

Dairy cows progressively deplete a pasture sward in successive layers, and these layers vary in their chemical composition.

As the milking order of dairy cows is relatively consistent, the objective of this study was to determine the effects of milking order on the quality and quantity of pasture accessed by dairy cows.

Two experiments were conducted. The association between milking order and time of paddock access was evaluated in the first experiment whilst the second experiment determined the association between the order in which cows entered the paddock (paddock access order) and the quality and quantity of kikuyu pasture (*Pennisetum clandestinum*) ingested by cows after milking.

Milking order was strongly associated with timing of paddock entry (R^2 = 0.92).

Over the duration of paddock entry, 70% of pasture (relative to post-grazing mass) was consumed before the last cow entered the paddock. Cows that arrived first to the paddock ingested pasture with approximately 21% greater ($p<0.01$) CP (19% vs 15%) and 15% lower ($p<0.01$) ADF (26% vs 30%) than those arriving last (Table 1.) Cows that accessed pasture last had greater ($P=0.03$) rumination than those accessing pasture first (567 and 544 minutes/cow/day, respectively.

This work presents a new insight into the amount of pasture on offer to, and the nutritive value of this pasture ingested by, cows when pasture is offered immediately after milking.

The nutritive value of pasture ingested by dairy cows varies within a herd (cont.)

With the intensification of dairy systems in both New Zealand and Australia, these preliminary findings highlight the opportunity to better formulate supplementary feeding strategies to account for differences in the nutritive value and amount of feed offered to individual cows. Alternatively, new systems to help reduce this variability could be designed.

Before such changes are considered, further work should be conducted to determine the nutritive value, and quantity of pasture, ingested for differing pasture species such as ryegrass and the impact this has, if any, on milk (solids) yield for individual animals within a herd.

This work has been published as the 'Proceedings of the 5th Australasian Dairy Science Symposium 2014'. The on-line version is available on the following link

http://www.adssymposium.com.au/inewsfiles/2014proceedings/64ClarkADSS2014.pdf

Table1. The nutritive value of pasture ingested (CP, NDF and ADF, % in DM) and sward height (cm) over the time of paddock access.

Time of access (min)	CP (%)	NDF (%)	ADF (%)	Sward height (cm)
0	19	60	26	42
15	19	60	26	42
30	18	62	27	37
45	17	63	28	34
60	16	64	29	31
75	15	65	30	27
90	15	65	29	28
105	15	65	30	26
SED	1	3	2	2

Modelling the impact of increasing herd size on milk yield, milking interval and profit in a pasture-based automatic milking system

Dr Rafiq Islam

Cows in an automatic milking system (AMS) are required to walk greater than 1 km when a modelled farm area was greater than 86 ha. This impacts on milking interval (MI), energy expenditure, milk yield (MY) and profitability in a large pasture-based AMS herd.

Growing more grazeable home grown feed/ha (HGF) based on the principles of complementary forage rotation (CFR) has the potential to reduce the required land areas and thus average and maximum walking distances.

Thus, a modelling study was undertaken with 12 scenarios consisting of 3 AMS herds (400, 600, 800 cows), 2 levels of pasture utilisation (15.0 t dry matter [DM]/ha, termed as 'moderate'; optimum pasture utilisation of 19.7 t DM/ha, termed as 'high') and 2 rates of grazeable CFR in a complementary forage system (CFS; pasture plus CFR; % farm planted into CFR as 0, 30%).

The aim of this study was to model the effect of large herd size (and land areas) on walking distances and MI, and their impact on milk yield and profit when 50% of the total diet is provided from HGF either as pasture or grazeable CFR in an AMS.

With moderate pasture utilisation, increasing the herd size from 400 to 800 cows resulted in an increase in total walking distances between the parlour and the paddock from 3.5 to 6.3 km. Consequently, mean MI increased from 15.2 to 16.4 h (Table 1).

High pasture utilisation (allowing for an increased stocking density) reduced the total walking distances up to 1 km and MI by up to 0.5 h compared to the moderate pasture and 800 cow herd combination (Table 1 on next page).

The high pasture utilization combined with 30% of the farm in CFR (plus 70% high pasture) in the farm increased milk yield by up to 1.5 kg/cow/d, thereby reducing loss by up to $0.5/cow/d (c.f. the moderate pasture and 800 cow herd scenario) (Table 1).

These results generated through modelling would be enhanced through field research investigating the impact of increased herd size on walking distances, energy loss, MI, milk yield and whole farm profitability.

Modelling the impact of increasing herd size on milk yield, milking interval and profit in pasture-based automatic milking system (cont.)

FUTUREDAIRY

Table 1. Effect of herd sizes, pasture utilisation (P) and percentage of area on grazeable complementary forage rotation (CFR) on walking distances, energy loss, milking interval (MI), milk yield (MY) and economic cost

Herd size (*n*)	P (t DM/ ha)	CFR[a] (%)	Area (ha)	Distance walked (km/d)	MI (h)	MYL GW (kg/ cow)	MYL MI (kg/ cow)	TML (kg/ cow)	TL($/ cow)
400	15.0	0	100	3.5	15.2	1.9	0.7	2.6	1.0
		30a	80	2.9	14.9	1.6	0.6	2.2	0.8
	19.7	0	80	2.9	14.9	1.6	0.5	2.2	0.8
		30b	70	2.7	14.8	1.4	0.5	1.9	0.7
600	15.0	0	150	4.9	15.8	2.8	1.1	3.9	1.5
		30	120	4.1	15.4	2.3	0.8	3.1	1.2
	19.7	0	120	4.1	15.4	2.3	0.8	3.1	1.2
		30	110	3.8	15.3	2.1	0.8	2.9	1.1
800	15.0	0	200	6.3	16.4	3.7	1.4	5.1	1.9
		30	160	5.2	15.9	3	1.1	4.1	1.5
	19.7	0	160	5.2	15.9	3	1.1	4.1	1.5
		30	140	4.6	15.6	2.6	1	3.6	1.4

[a]CFS 0 represents 100% pasture and CFS 30 represents 30% complementary forage rotation and 70% pasture; ME = metabolisable energy; MYL GW, milk yield loss due to grazing and walking (GW); MYL MI, milk yield loss due to MI; TML, total milk yield

Thinking beyond the dairy ….learn through innovations!

In NSW a group of farmer innovators has been brought together to challenge the status quo and to catapult us all into some unexplored territory. This group aims to explore the 'what's possible' through emerging technology and precision agriculture opportunities as a means to tackling priority farm issues and driving greater profitability for dairy in NSW.

The NSW Dairy Innovation Group is a joint initiative of Dairy Australia's NRM Program '*Profitable Farming in a Carbon Constrained Future*' and Sydney University's Dairy Science Group. Brought together by Dr Cameron Clark, Senior Research Fellow within the Faculty of Veterinary Science and Marguerite White, Dairy Australia's NRM Technical Specialist for the state of NSW.

The aim of the Group is to feed ideas into new research opportunities, provide input and feedback into existing and ongoing research, and assist in the identification, trial and demonstration of internationally available technology or precision agriculture tools which have the potential to be adapted and adopted by the local dairy industry. A priority of the Group is to look beyond usual shores into other industry sectors for some of the 'what's possible'.

Cameron Clark (far left) with other members the NSW Dairy Innovation Group

The six key farmer members come from all corners of the State and were identified by both their peers and industry service providers as being not only innovative thinkers, but farmers who had respect for their 'know how' and 'give it a go' attitudes.

Thinking beyond the dairy ….learn through innovations! (cont.)

'This was important to ensure that any Group outcomes would have relevance to local regions and also so that the members could provide a regional representative in identifying and communicating the needs of their peers to researchers and technology developers, especially for ensuring that the work of the Innovation Group adds value to the financial, social and environmental credentials of dairy farming businesses in NSW,' provides Marguerite.

The members of the Group are Andrew D'Arcy (Bega), Daniel Redgrove (Singleton), Jason Bake (Coffs Harbour), Wayne Clarke (Casino), Ruth Kydd (Finley) and Rob Cooper (Manilla).

Due to the geographical location of the members, which reflects the spread of the industry as a whole in NSW, the use of technology has become import to effectively share ideas and communicate. The Group undertakes teleconferences, has a LinkedIn Group for day to day interaction, and utilises a cloud based programme called Drop Box for sharing any files and documents.

Recently, the Group met face to face for the second time at the University of Sydney's Camden campus, home to Future Dairy. It was certainly down to work with presentations from various guest speakers ranging from genomics to ways of handling 'big data' as applied in other research areas and a little time to look at the recent advances in technology associated with dairying.

The possibilities for the NSW Dairy Innovation Group seem endless at this point in time, with future connections to be made with similar groups in the USA and UK. Initially the Group is interested in hearing from dairy farmers across the State of NSW about how they believe their priority needs can be addressed through advances in technology and precision agriculture.

Thinking beyond the dairy …. Learn through innovations! (cont.)

Key questions have been posed to the broader NSW dairy community, through SMS- of course, and the results of which have been compiled by the group into 3 priority areas which will now form the basis for the group's 2015 work:

1. **Data management**

   Topics: Making more informed decisions around resource allocation at a paddock/ within paddock scale and smartphone applications for more efficient cataloguing of chemicals and drug use.

2. **Technology to assist daily tasks on farm**

   Topics: Retrofitting robots for milking cows, smarter fencing systems, and technology to monitor core body temperature.

3. **Reducing waste**

   Topics: Increasing the value of dairy calves, and technology to optimise the timing and location of nitrogen application.

For more information on the group, for any feedback on topic areas or for the potential to work/collaborate to address any of the topics within priority areas please contact either Cameron Clark (cameron.clark@sydney.edu.au) or Marguerite White (mwhite@icdprojectservices.com.au).

POST GRADUATE UPDATES

Alex John *PhD Student*

It seems to be the season of presenting at the moment. I've recently presented at our annual faculty postgraduate conference, Ag Institute of Australia's National Student Awards and just the other day a host of 80 Belgium and Dutch farmers complete with on stage translator!

I represented my home state of Tasmania at the Ag Institute of Australia National Student Awards, presenting my work into pasture management in automatic milking systems that I completed whilst at the University of Tasmania.

The winner was determined from a combination of a written essay and oral presentation and I was thrilled to take home third prize. I must thank the Ag Institute of Australia and Peracto Australia for their initiative to hold the awards, giving young scientists like myself the opportunity to get our work out there.

I'm now doing my final preparations for my cow feeding trials. We have two trials to begin with, one looking at the nutritional ecology of cow diet selection and the second looking at the timing of feed quality and quantity throughout the day on cow eating behaviour.

Alex (far left) was placed third in the Australia National Student Awards recently.

Both of these experiments will begin around late February and last for around a month each. We hope to then use the findings from these trials to formulate management practices to test on the AMR at Corstorphine.

Saranika Talukder

PhD Student

Congratulations to Saranika and her husband Subir on the birth of a beautiful daughter they have named Rajasri (family pictured right). Congratulations also on submitting her thesis in February!!

Milk oxidant and antioxidant status in dairy cows with ovulatory versus anovulatory oestrous cycles

A study was conducted to evaluate changes in milk profiles of oxidative stress (OS) biomarkers in dairy cows with ovulatory and anovulatory oestrous cycles. Thirty (11 primiparous and 19 multiparous) healthy, lactating, cycling Holstein Friesian dairy cows averaging 60 ± 17 days in milk, and producing 33 ± 6 kg of milk per day were enrolled in this study.

Composite milk samples were collected thrice weekly and assayed for progesterone concentration and the following OS biomarkers: superoxide dismutase (SOD), advanced oxidation protein products (AOPP), ceruloplasmin, glutathione (GSH), β-carotene and glutathione peroxidise (GSH-Px). Individual milk progesterone profiles were constructed for each cow to characterise ovarian activity so that cows' oestrus cycles could be identified as ovulatory (n = 20) or an-ovulatory (n =10).

Oestrous cycle was categorised to different phases; oestrus (day 0), metoestrus (day 2-4), dioestrus (day 5-17) and prooestrus (day 17-20) to examine the changes of oxidants and antioxidant status across the different phases of the oestrous cycle. Day of ovulation was considered as day of oestrus (day 0). Differences in OS biomarkers were compared between two groups (ovulatory vs an-ovulatory) using linear mixed models with cow identification number being a random factor.

Cows with ovulatory oestrous cycles presented significantly higher SOD levels compared to cows that did not ovulate (Figure 1A; $P < 0.05$). On the other hand, GSH-Px and GSH concentrations were lower in ovulated cows compared to the an-ovulated cows (Figure 1B and 1C, respectively; $P < 0.05$).

Saranika Talukder *PhD Student*

Milk oxidant and antioxidant status in dairy cows with ovulatory versus anovulatory oestrous cycles (cont)

The highest level of AOPP was noted during the pro oestrus phase while β-carotene presented its lowest values during oestrous. It could be postulated that the elevated level of milk SOD and the observed lower level of GSH-Px and GSH in ovulating cows may be the essential events preceding the ovulatory response.

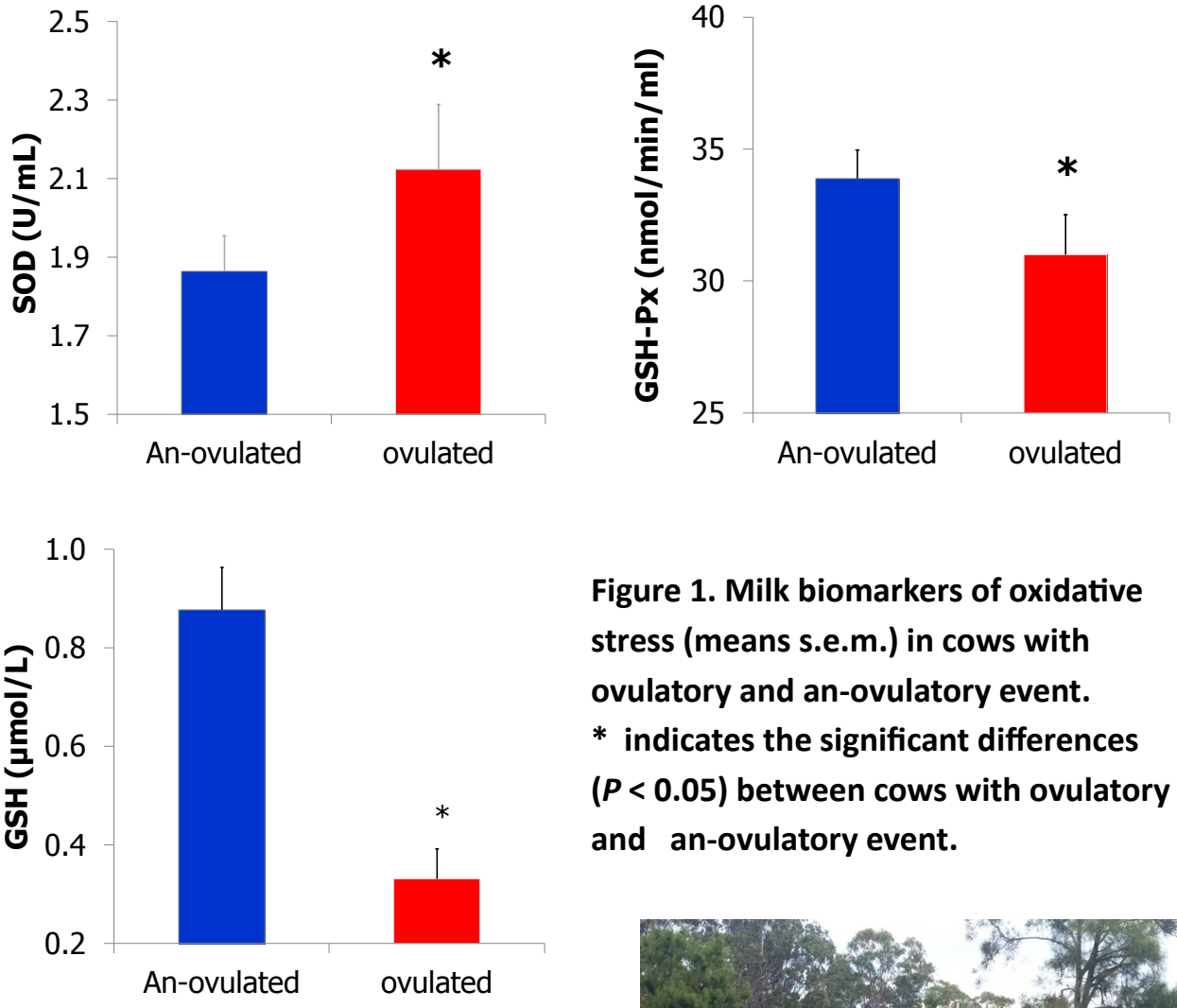

Figure 1. Milk biomarkers of oxidative stress (means s.e.m.) in cows with ovulatory and an-ovulatory event. * indicates the significant differences ($P < 0.05$) between cows with ovulatory and an-ovulatory event.

These findings were presented at the first DairyCare Conference **'Health and Welfare of Dairy Animals'** in Copenhagen (Copenhagen University Frederiksberg Campus) in late 2014.

POST GRADUATE UPDATES

Tori Alexander (nee Scott) *PhD Student*

The aim of my research over the past several years has been to explore the use of incentives to encourage voluntary cow traffic in the pre-milking yard of a pasture-based AMS (i.e. encourage cows to spend less time in the pre-milking yard and present for milking efficiently).

The main driver behind this has been the introduction of high-throughput technology (the robotic rotary) that will enable large herd sizes (estimated between 600 to 800 cows milked twice daily) to be milked on a single robotic unit rather than through multiple single-box units (approx. 60-70 cows per unit). At the time that I commenced my research, we knew that AMS can successfully operate in pasture-based conditions thanks to the efforts of our early 'pioneer' adopters and the research farms in Camden and Waikato (New Zealand).

However, we didn't know how cows would respond to the robotic rotary when managed under voluntary traffic conditions, and we had limited knowledge of what 'normal' cow traffic was and how to encourage it.

One of the biggest differences between the robotic rotary and single-box units is that the robotic rotary has only one entry point (entrance to the robotic arms and milking equipment) compared to multiple entry points for similar size herds milked with single-box units (one entrance per single-box unit).

Therefore any risk of congestion (e.g. dominant cows monopolising the entrance) in the pre-milking yard is potentially higher in the robotic rotary system, making it essential that we understand not only how cows traffic onto the unit, but also how we can most efficiently manage cow traffic to minimise congestion in this area.

Tori Scott *PhD Student (cont.)*

While it has been a challenge to conduct research in an area where very little was known, it has been exciting to contribute to increasing our industry's knowledge and understanding of pasture-based AMS which will hopefully be useful not just for farms currently operating AMS but also for those considering the technology, or that may consider it in the future.

KEY RESEARCH OUTCOMES

Offering feed in close proximity to the milking event greatly reduced (in some cases halved) the time cows spent in the pre-milking yard for cows that had previously been fed at milking (e.g. fed in a conventional parlour, or fed in a single-box AMS).

I mention 'close proximity', as this was true when cows were offered feed while on the robotic rotary platform, or directly after exiting the platform.

However, during a preliminary investigation into using a forage crop that was up to 600 m from the dairy as an incentive, no difference was detected.

This lack of effect of a forage crop could be contributable to the short nature of the investigation however these results still indicated that forage crops could be integrated into grazing practices within AMS without negatively impacting cow traffic (therefore could still prove beneficial from the perspective of enabling farmers to increase the quantity of home-grown feed, as is the case with complementary forage systems).

Young cows (particularly heifers) are more likely to be efficient and quick traffickers at the dairy, as are higher producing cows (although this was not related with stage of lactation, which did not influence the length of time cows spent in the pre-milking yard).

Voluntary cow traffic and behaviour in the premilking yard of a pasture-based automatic milking system with a feed supplementation regime

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ABSTRACT

Operating a voluntary, pasture-based automatic milking system presents challenges not encountered in indoor-housed systems, including long walking distances, exposure to climatic changes and large herd sizes. Feed incentives can be used to encourage voluntary cow traffic in both pasture and indoor systems, and may be particularly useful at the dairy where the risk of congestion is high if cows do not progress through the system promptly. The present study investigated the effect of a supplementary feeding regime on voluntary cow traffic and cow behaviour in the premilking yard of a pasture-based automatic milking system. Cows were strategically granted access to supplementary feed given at the dairy either before (*PRE*) or after (*POST*) milking. The mean voluntary waiting time, being the length of time it took for a cow to present for milking when given uninhibited access to the robotic unit, was 21% shorter for cows in the *POST* treatment than for those in the *PRE* treatment (60.2 ± 4.6 and 76.1 ± 6.0 min respectively). Additionally, a greater proportion of hourly voluntary milkings throughout the day and early night were associated with cows in the *POST* treatment. On average, high yielding cows and cows in their first or fourth lactation spent less time in the premilking yard. Voluntary waiting time increased as queue length increased, with cows waiting (on average) less than 53 min when there were fewer than 20 cows (equivalently, 14 cows/100 m^2) in the premilking yard and more than 90 min when queue length exceeded 40 cows (equivalently, 28 cows/100 m^2). Cows in the *POST* treatment were more likely to be observed facing towards the robot and located closer to the robot entrance, and were less likely to be observed lying down in the premilking yard. Results indicated that offering supplementary feed directly following milking favourably altered cow behaviour and successfully reduced the voluntary waiting time of cows in the premilking yard, with the potential to reduce congestion in the dairy facility, as well as improve cow health and system performance.

1. Introduction

Initial studies and surveys conducted in indoor automatic milking systems (AMS) where cows had access to pasture demonstrated that grazing cows at pasture was

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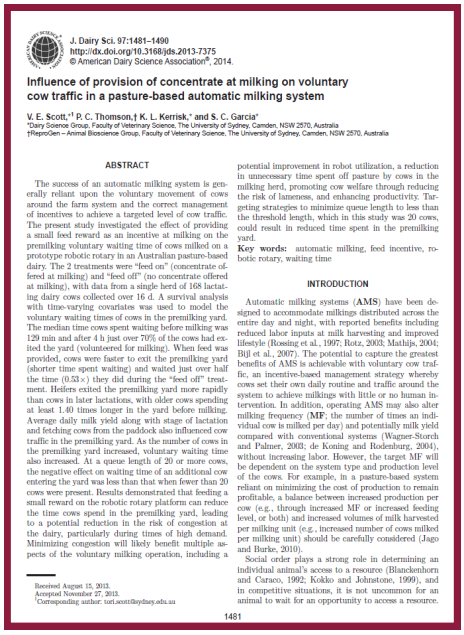
Read Tori's paper on cow traffic and behaviour in the pre-milking yard published in late 2014 published in Livestock Science.

Tori Scott *PhD Student (cont.)*

Our management practices can impact on cow traffic at the dairy, and some a lot more than we first realised. For example, forcing cows to wait to be milked once they arrive at the dairy (due to cleaning of the equipment, maintenance or breakdown, for example) consistently increased the length of time cows subsequently waited before voluntarily presenting for milking.

Queue length (the number of cows waiting in the pre-milking yard) has a strong effect on pre-milking waiting time with the appearance of a 'threshold' of approx. 14 cows/100 m2, after which traffic was significantly affected. It is logical that queue length influences cow traffic (more cows = greater competition and a physical 'barrier' to the robotic unit entrance, similar to the long queues we battle with Christmas shopping), however we now need to come up with management strategies that can assist in ensuring the queue remains below the 'threshold' to maximise efficient traffic.



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Influence of provision of concentrate at milking on voluntary cow traffic in a pasture-based automatic milking system

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ABSTRACT

The success of an automatic milking system is generally reliant upon the voluntary movement of cows around the farm system and the correct management of incentives to achieve a targeted level of cow traffic. The present study investigated the effect of providing a small feed reward as an incentive at milking on the premilking voluntary waiting time of cows milked on a prototype robotic rotary in an Australian pasture-based dairy. The 2 treatments were "feed on" (concentrate offered at milking) and "feed off" (no concentrate offered at milking), with data from a single herd of 168 lactating dairy cows collected over 16 d. A survival analysis with time-varying covariates was used to model the voluntary waiting times of cows in the premilking yard. The median time cows spent waiting before milking was 129 min and after 4 h just over 70% of the cows had exited the yard (volunteered for milking). When feed was provided, cows were faster to exit the premilking yard (shorter time spent waiting) and waited just over half the time (0.53×) they did during the "feed off" treatment. Heifers exited the premilking yard more rapidly than cows in later lactations, with older cows spending at least 1.40 times longer in the yard before milking. Average daily milk yield along with stage of lactation and fetching cows from the paddock also influenced cow traffic in the premilking yard. As the number of cows in the premilking yard increased, voluntary waiting time also increased. At a queue length of 20 or more cows, the negative effect on waiting time of an additional cow entering the yard was less than that when fewer than 20 cows were present. Results demonstrated that feeding a small reward on the robotic rotary platform can reduce the time cows spend in the premilking yard, leading to a potential reduction in the risk of congestion at the dairy, particularly during times of high demand. Minimizing congestion will likely benefit multiple aspects of the voluntary milking operation, including a potential improvement in robot utilization, a reduction in unnecessary time spent off pasture by cows in the milking herd, promoting cow welfare through reducing the risk of lameness, and enhancing productivity. Targeting strategies to minimize queue length to less than the threshold length, which in this study was 20 cows, could result in reduced time spent in the premilking yard.

Key words: automatic milking, feed incentive, robotic rotary, waiting time

INTRODUCTION

Automatic milking systems (**AMS**) have been designed to accommodate milkings distributed across the entire day and night, with reported benefits including reduced labor inputs at milk harvesting and improved lifestyle (Rossing et al., 1997; Rotz, 2003; Mathijs, 2004; Bijl et al., 2007). The potential to capture the greatest benefits of AMS is achievable with voluntary cow traffic, an incentive-based management strategy whereby cows set their own daily routine and traffic around the system to achieve milkings with little or no human intervention. In addition, operating AMS may also alter milking frequency (**MF**; the number of times an individual cow is milked per day) and potentially milk yield compared with conventional systems (Wagner-Storch and Palmer, 2003; de Koning and Rodenburg, 2004), without increasing labor. However, the target MF will be dependent on the system type and production level of the cows. For example, in a pasture-based system reliant on minimizing the cost of production to remain profitable, a balance between increased production per cow (e.g., through increased MF or increased feeding level, or both) and increased volumes of milk harvested per milking unit (e.g., increased number of cows milked per milking unit) should be carefully considered (Jago and Burke, 2010).

Social order plays a strong role in determining an individual animal's access to a resource (Blanchenhorn and Caraco, 1992; Kokko and Johnstone, 1999), and in competitive situations, it is not uncommon for an animal to wait for an opportunity to access a resource.

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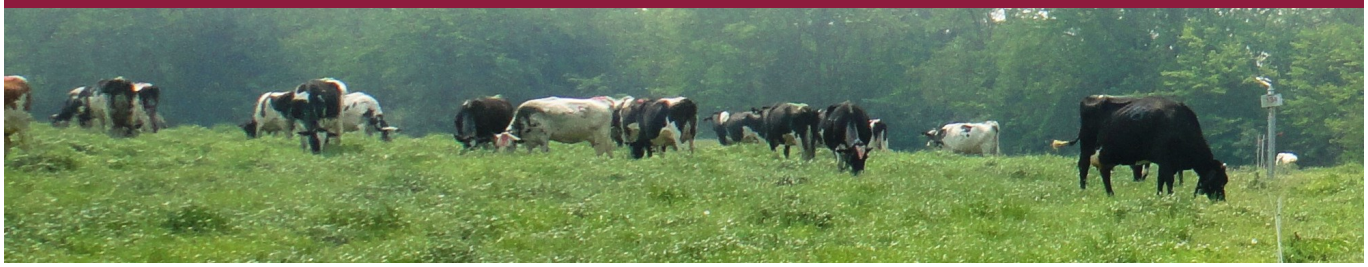
Tori's paper on concentrates and the effect on a voluntary milking herd has recently been published in the Journal of Dairy Science

Finally, the use of a priority laneway (simply a smaller area physically separated from the main waiting yard) reduced the waiting times of cows sent to this lane. This could be highly useful for dealing with slow or nervous cows as it allows them to bypass the main queue and gain direct access to the robotic unit however operators must remain cautious regarding the number of cows that are sent to this laneway. For example, if half the herd is sent to the laneway, which could be as little as 10% of the total waiting yard area (as an example), the benefits of bypassing the main queue are forfeited. At this point it is not clear as to what percent of the herd can be sent to this laneway without over-crowding, although it will likely be related to herd size, capacity of the system and the physical size of the priority laneway.



Ashleigh Wildridge *PhD Student*

A new year already, where did time go! I have now successfully managed to complete my field work for my first trial looking at the response of cows to being fetched at night.

I travelled down to Victoria where I spent four weeks on a pasture based automatic milking system (AMS) operating with voluntary cow movement. After a week of getting organised and getting the cows used to me walking around them at night with a torch, I then spent 18 nights observing cows for up to three hours from 11pm or 1am. The cows were encouraged out of the paddock and left to walk to the dairy voluntarily while I took observations on the cows behaviour.

The aim of this was to determine if the cows could be automatically herded out of a paddock at night to then take themselves to the dairy to be milked.

Performance data are still to be analysed as yet, but behavioural observations suggest that regardless of the time of night most cows will take themselves to the dairy to be milked.

Now back in Camden I have been preparing myself for my next two projects coming up where I am excited to be working with the cows in our new automatic milking rotary at Corstorphine and also working with several commercial farmers who have decided to make the change to automatic milking.

Juan Molfino *M.VSc. Student*

I'm pleased to announce that since August 2014 I'm officially enrolled in a Masters in Veterinary Science! My research will be focus on how to incorporate a robotic rotary into a large pasture base dairy farm operating with voluntary traffic.

I am working under the supervision of Yani Garcia and Kendra Kerrisk .

The Automatic Milking Rotary (AMR™) is a high throughput Automatic Milking System that was co-develop between DeLaval and the FutureDairy project.

This equipment was designed to suit voluntary cow traffic under Australian pasture-based farming systems.

It operates 24 hours per day and also has the potential capability to do approximately 1600 milkings per day, creating the opportunity to milk in the order of 600-800 cows at 2-2.5 milkings/cow/day.

The key challenge for AMR™ with large herds is to achieve a minimum of 2 milkings/ day (as cows would have in a conventional system) together with adequate levels of pasture utilisation across the whole farm. The two main areas in which I will focus my research are herd dynamics and walking distances.

Herd dynamics of a large herd operating voluntarily under a pasture based system are totally unknown and may be significantly different from the typical small-moderate herd affecting cow movement and this requires a better understanding.

The second area of research is in relation to walking distances. In pasture based systems larger herds mean larger farms and therefore longer walking distances for cows.

Modeling conducted by our group showed that when walking distances increases over one kilometer, milking frequency starts to be affect and therefore milking yield could be reduce. How are we going to address this challenge? Keep an eye on the next Newsletter!

Juan Molfino (cont.)

On this first stage of the project I'm working with data from Corstorphine Dairy farm in order to identify and address inefficiencies within the Automatic milking systems, at both individual cow and the herd level. Once we identify them, the next step will be to understand their impact on the whole system performance and find alternatives in order to increase efficiency and improve productivity.

Last but not least last month I had the opportunity to attend to the Australian Dairy Australasian Dairy Science Symposium 2014 in Hamilton, New Zealand. Was a great experience to present the AMS Labor Audits Case Studies to a wide and important audience. This was an outstanding conference with lots of interesting topics and a fantastic opportunity to meet new people from Australia, New Zealand and also from Europe.

DRF 2014 ANNUAL GENERAL MEETING

11.00am - 1.00pm

Tuesday 28th April 2015

Veterinary Science Conference Centre

Camperdown Campus

VISITORS TO CAMDEN

Kamila Maciel Dias

Kamila Maciel Dias is currently doing a PhD at Santa Catarina State University (UDESC) in south of Brazil and will spend a year with the Dairy Science Group as an Occupational Trainee as part of her studies. She has come to Australia on a full scholarship from the Brazilian Government (CAPES).

Kamila's area of expertise is 'nutrition of grazing dairy cows and milk composition'. Whilst doing her Masters degree she studied the fatty acid composition of elephant grass (*Pennisetum purpureum* Schum.) in relation to milk composition and during her PhD studies she has evaluated the effect of black wattle (*Acacia meanrsii*) in milk protein yield and milk fatty acid composition.

Her work here will be in principle related to individual cow variations in milk fat and milk fatty acid composition both within system and perhaps also between AMS and conventional systems (as 'inconsistency' in day to day diet is likely greater in AMS than CMS).

Her work also will help to investigate the cases of milk fat depression/milk fat syndrome in pasture-based dairy cows (a recurrent problem in many herds and not always related to high concentrate/low fibre diets).

Welcome Kamila, we hope you enjoy your time here!

VISITORS TO CAMDEN

With the commissioning of the AMR at Cortsorphine, the requests for visitors has increased in the last few months and we are currently hosting on average 2 groups a week at the farm.

In September we were given the opportunity to host a group of delegates from the International Symposium on the Nutrition of Herbivores/International Symposium on Ruminant Physiology (ISNH/ISRP) which was held in Canberra.

The group of 100 travelled up for the day and were informed of the latest research being conducted by the Dairy Science group and given a tour of the new AMR dairy at Camden.

We anticipate having the opportunity of hosting a lot more of these events in the coming years.

Left: Foundation Director Yani Garcia speaks to a group from the ISNH/ISRP Conference

Below left: Post grad student Juan Molfino and former student Nico Lyons (NSW DPI) talk to the audience about our research

Below: The Annexe at Corstorphine farm was the venue for lunch and a bit of networking on the day

Joint ISNH/ISRP International Conference 2014

Almost 500 delegates from 50 different countries that attended the 1st joint International Symposium on the Nutrition of Herbivores/International Symposium on Ruminant Physiology (ISNH/ISRP) that was held in Canberra from the 8th to the 12th of September in 2014.

DRF Councillor Dr Pietro Celi chaired the organising committee for this event which offered opportunities for Australians who work and study in the field to meet with others and explore multiple facets of animal production at global and local levels.

Bringing people from so many countries together allowed the group to examine strategies which look after the planet and our environment in the face of increased demand for food. Energy use, better use of limited resources, optimising production, enhanced animal health, welfare and food safety, and healthier food for a hungry world were some of the major themes explored.

The DRF was well very represented alongside Pietro in his role as Chair, were Councillors Ian Lean and Russell Bush who both spoke at the Conference.

Herbivore Field Day held in Camden

The Dairy Science Group hosted delegates from the ISNH/ISRP Conference on Camden Farms on the final day of the event in September last year.

The group were amongst the first to see the new AMR at Corstorphine and listened to talks on by the Dairy Science team on Automatic Milking and Feedbase practices.

Delegates were also given some insight into farming innovations and what they could look like in the future with the herding robot being used in research on Camden Farms.

THANK YOU TO OUR MEMBERS FOR YOUR CONTINUING SUPPORT

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