



DIRECTORS' UPDATE



*Assoc. Prof. Yani Garcia
DRF Director and Dairy
Science Group Leader*



*Mr Bill Inglis
DRF President*

Welcome to the 2nd edition of the 2014 DRF Newsletter!

The new robotic rotary (DeLaval AMR™) has been installed at the University of Sydney's Corstorphine dairy farm and initial testing commenced in August! The farm is milking 380 cows at the moment so we foresee busy times ahead until the cows - and staff! - become familiar with the new voluntary traffic system. These are very exciting times for the whole University and in particular the DRF and the Faculty of Vet Science!

The 2014 Symposium held in the Hunter Valley in June was another huge success for the DRF!

Take a look inside at these and other updates including the new phase of FutureDairy, current research and the traditional updates on student, trainees and int'l visitors!

Yani Garcia

FROM THE PRESIDENT

This years Symposium held in the Hunter Valley was a great success.

One extremely pleasing aspect was the way the whole industry came together, with Dairy NSW and Dairy Connect meeting on the Wednesday before the Symposium. These meetings were very well attended.

Kerry Kempton from DPI won the Dairy Science Award and Dairy Australia were well represented by Chairman Geoff Akers and MD Ian Halliday. Add this to a wonderful group of speakers, sponsors, delegates and our invaluable organising committee and we had all the ingredients necessary for an enjoyable and educational three days.

Bill Inglis



Alison and John Redgrove, along with son Daniel and daughter-in-law Sarah, hosted Day 2 of the 2014 Symposium at their Scotts Flat property 'Rowanvale' (below)



THE DAIRY RESEARCH FOUNDATION'S
2014 SYMPOSIUM
JUNE 19-20
POKOLBIN, HUNTER VALLEY NSW GROWTH THROUGH SCIENCE & INNOVATION



2014 SYMPOSIUM

GROWTH THROUGH SCIENCE & INNOVATION

The DRF team have recently returned from a very successful Symposium held this year at the Sebel Kirkton Park, Pokolbin, NSW.

The 2014 event was attended by over 180 people who enjoyed the very picturesque Hunter Valley and the insights into the dairy industry provided by the excellent speakers.

Delegates once again found the conference content relevant and interesting. The universal comment was that 'this program was the 'best yet'.

The 'young demographic' that was evident in the audience was a great sign that the industry is attracting young people to it!

The on-ground support and local knowledge provided by Kerry Kempton (pictured below left with John Redgrove) was critical to the success of the event and the DRF thanks her profusely for all her help.

Kerry was also the recipient of the 2014 Dairy Science Award and it was lovely to be able to present this to her on her 'home turf'. Congratulations Kerry!

Day 1 presentations were a mix of science, industry and the farmers perspective. This seems to be a very popular mix and the farmer experiences particularly keep the program 'real'.

Included in this issue:

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2014 SYMPOSIUM

GROWTH THROUGH SCIENCE & INNOVATION

The second day was held at Alison and John Redgrove's property 'Rowanvale' which is located at Scotts Flat, about 15 minutes from Singleton, NSW.

The farm visit was highlighted by our Emerging Scientists Competition. This features young students from around Australia who are undertaking post graduate studies in dairy science or related.

The Award for 'Best Paper' went to Rauiri McDonnell from DAFWA (Dept. Ag. and Food, WA) and the best presentation was awarded to Stephanie Bullen from the University of Melbourne, Victoria. Second and Third place were awarded to Sarah Tierney and Patricia Eats (respectively) both of the University of Adelaide, SA.

2014 was again, a brilliant showcase of the dairy industry and the research being conducted to ensure its longevity.

2014 EMERGING SCIENTIST PROGRAM



A highlight of Day 2 was the Emerging Scientist competition which was won by Stephanie Bullen (above left)



Congratulations to Dairy Connect!



Australian readers of this Newsletter would have seen the recent news about fresh milk export to China, a very smart move led by Dairy Connect under the leadership of its Chairman, George Davey and its CEO, Mike Logan.

However, Dairy Connect is not stopping there and in fact is leading a development to encourage unification of the NSW Dairy Industry and to provide the basis for a real strategy to grow the NSW Dairy Industry, the second largest of Australia.

Dairy Connect is setting an ambitious but potentially achievable target of growing the NSW industry by 50% in 5 years. This extra volume of milk could be channeled through the development of new export markets for infant formula and fresh milk into China. To achieve this, Dairy Connect is developing strategies to increase the manufacturing capacity in NSW through either new investment and/or upgrading of existing capacity.

The DRF is a proud member of Dairy Connect and fully supports this and any other courageous and innovative developments that can result in profitable growth of the NSW dairy farmers and the NSW Dairy Industry as a whole. From a research perspective, such growth aligns with our vision of a high-efficiency-Australian-dairy systems (HEADS). We hope all dairy farmers in NSW will align with this too and support Dairy Connect's developments.

Finally we are talking about potential growth and positive outlooks for the industry...!

Yani Garcia, Director DRF

George Davey, Chair of Dairy Connect recently met with members of the China Chamber of Commerce (below) to discuss fresh milk export to China



New invited review on kikuyu-based pastures

We have just published a new invited review on kikuyu-based pastures for dairy production. The review draws data from many parts of the world where kikuyu is used in dairying, including Australia, NZ, South Africa, Colombia and Costa Rica. The potential for kikuyu-based pasture is huge and adequate system design and strategic and tactical management can overcome most of their limitations.

The review (pictured opposite) can be downloaded from the **Crop and Pasture Science** web site (<http://www.publish.csiro.au/paper/CP13414.htm>) or by request to the authors (sergio.garcia@sydney.edu.au).

Kikuyu-based pasture for dairy production: a review

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Abstract. The amount of pasture grown and converted to animal product is closely linked with the profitability of pasture-based systems. Kikuyu (*Pennisetum clandestinum* Hochst. ex Chiov.) is the predominant C₄ grass in coastal Australian beef and dairy systems. These kikuyu-based production systems face several key challenges to achieving high levels of productivity. In this review, we bring together the literature to highlight the opportunities for closing the gap between current and potential utilisation and for increasing dairy production from kikuyu-based pastures. More specifically, we highlight the significant gains that can be made on kikuyu-based commercial farms based on a conceptual model to show where the main losses originate, namely input and grazing management. The physical limitations associated with kikuyu for dairy systems are also presented, such as the relatively higher content of cell wall and lower content of water-soluble carbohydrates, together with nutrient imbalances relative to other grass species. Together, these limitations clearly indicate the need of supplying cows with supplements (particularly grain-based concentrates) to achieve moderate to high milk yield per cow. To achieve this without compromising pasture utilisation, dairy producers farming on kikuyu-based pastures need to use relatively greater stocking rates to generate enough demand of feed that can be used to align rate of pasture intake with rate of pasture growth, creating enough deficit of feed per cow to justify the addition of supplementary feed without impinging on pasture utilisation. The variability that exists between cows in kikuyu dry matter and neutral detergent fibre intake is also highlighted in this review, opening up new avenues of research that may allow significant productivity gains for kikuyu-based dairy farming in the future.

Additional keywords: dry matter yield, grazing management, milk production, pasture allocation, pasture-based dairy, pasture utilisation.

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Introduction

Low cost, pasture-based production systems are a key competitive advantage for the wool, meat and milk commodities of Australia. In dairying, the profitability of pasture-based systems is closely associated with the amount of pasture (or home-grown feed) converted into animal product (García and Fulkerson 2005). This, in turn, is a function of the amount of plant tissue harvested by the animals, otherwise known as 'utilisation' (Holmes *et al.* 2002; García and Fulkerson 2005), and the efficiency of its conversion into milk (Beever and Doyle 2007).

In the southern Australian states of Victoria and Tasmania, dairy farms are mostly reliant on perennial ryegrass (*Lolium perenne* L.) as the predominant grass species. Conversely, tropical grasses are the predominant dairy forage in summer and autumn along the coastal areas of New South Wales and Queensland (Doyle *et al.* 2000; Fulkerson and Doyle 2001). The predominant C₄ grass used in coastal beef and dairy systems is 'kikuyu' (*Pennisetum clandestinum* Hochst. ex Chiov.) (Fulkerson and Doyle 2001). Kikuyu is a perennial tropical grass of C₄ photosynthetic pathway adapted to subtropical and

warm-temperate climates, believed to have originated on the highland plateau of central and east Africa at altitudes above 1500 m and under annual rainfall regimes exceeding 1000 mm (Matis 2001). Outside Australia, kikuyu also constitutes the pasture base of dairy regions in Northland (New Zealand), KwaZulu-Natal (South Africa), Colombia (South America) and Costa Rica (Central America). In the USA, kikuyu is listed as a Federal noxious weed (USDA 2014). In many of these regions and particularly much of Australia and New Zealand, kikuyu is dormant in winter and/or early spring, and therefore, other grasses (e.g. annual ryegrass, *Lolium multiflorum* L.) and/or crops (e.g. oats, *Avena sativa* L.) are used to 'fill the gap' when kikuyu is inactive.

Kikuyu is well known for its high yield potential, excellent response to fertility and water, resistance to trampling and persistence (Fulkerson and Lowe 2003b), with dense rooting systems that can be >2 m deep (Nie *et al.* 2008). Less desirable characteristics include its aggressive/dominance features resembling weedy behaviour; poorer nutritive value than other perennial grasses, mineral imbalances, animal poisoning, and

Could ruminant data help to predict dairy cows' calving time in the future?

Dr Cameron Clark

Did you know that the Australian dairy herd size has doubled over the last 20 years? Australian dairy farmers are already working long hours and larger herds means less time for attention of individual animal to monitor and intervene with events such as calving.

The good news is that new technology can help focus the limited labour resource on individual cows that require assistance. One new and available technology are activity and rumination devices that can be fitted onto individual cows. To evaluate if they can help with prediction of calving, we conducted a field study with two objectives: first, to determine the profiles of rumination duration and level of activity as determined by sensors between and within days around calving; and second, to use these data to predict the day of calving for pasture-based dairy cows.

Could rumination data help to predict dairy cows' calving time in the future? (cont.)

We fitted SCR HR LD Tags (Hi Tag, SCR Engineers Ltd., Netanya, Israel) on 27 cows 2 weeks before their "expected" calving date. The cows were then located in a 40 x 90m paddock and offered ad-libitum oaten hay and 2kg grain-based concentrate/cow/day until calving. The SCR tags captured hourly activity and rumination data for each cow and we then fitted these data into mathematical models to represent trends and averages.



Cow wearing SCR Tag /Collar

The key result of this study was that rumination duration decreased by 33% over the day prior and the day of calving, with the decline in rumination duration starting the day pre-partum (see Figure 1).

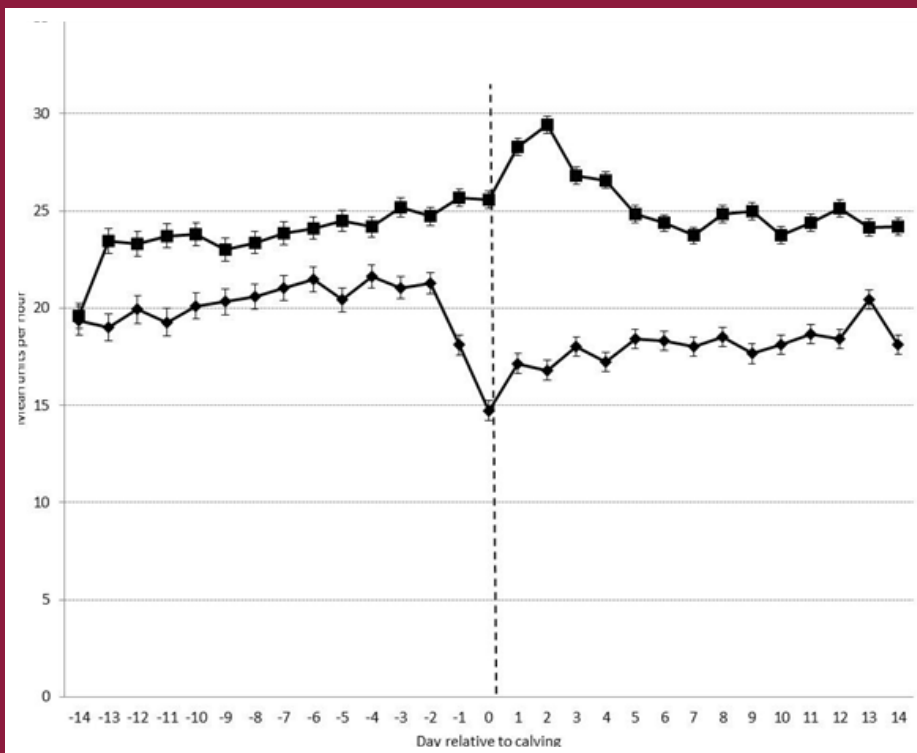


Figure 1. Mean (\pm SE) level of rumination (minutes/hour) (diamond) and activity (units/hour) (square) relative to the day of calving (day 0).

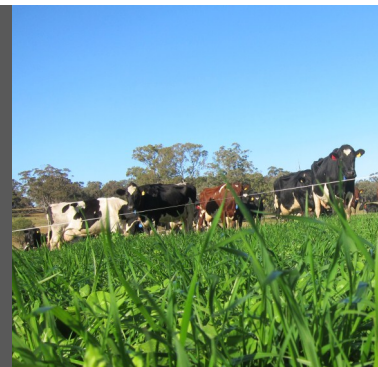
It was also interesting to note that activity levels were maintained pre-partum but increased in the days post-partum (Figure 1), probably associated with the maternal instinct of searching for the calf.

Overall, this preliminary study showed the potential to use rumination duration to predict the day of calving and the opportunity to use sensor data to monitor the animal health.

For more information please contact Cameron at cameron.clark@sydney.edu.au

Impact of Automatic Milking Systems (AMS) on labour and lifestyle on commercial farms in Australia

Juan Molfino



Labour and lifestyle benefits top the list of reasons why dairy farmers are adopting automatic milking systems (AMS). In 2013 and the first part of 2014 we conducted labour and lifestyle audits on five commercial AMS farms in Australia and we created five Labour Case Studies.

I'm pleased to announce in this edition that the Labour Case Studies have now been published on the FutureDairy website - <http://www.futuredairy.com.au> - and the report I presented at the 2014 Dairy Research Foundation Symposium is available on the DRF website - <http://sydney.edu.au/vetscience/foundations/drf/2014Proceedings-web.pdf> - on page 105.

These five case studies work as a reference that farmers considering adopting the AMS technology can relate to. It will also allow them to develop realistic expectations and assess the impact of what they are likely to achieve with their herd size, farm system type and other farm systems specifics. These documents will also help farmers contemplating the investment to visualize the potential impact of AMS and the variety of ways in which the impact can be captured on farm to ensure they are best positioned to reap the benefits of their investment.



Future Dairy want to especially thank those five farmers and their families whom opened their farms to us and for more than one year worked closely with us, providing us with the information we needed and giving us the opportunity to develop this specific body of work.

On the next page is a summary of the 5 Case Studies – Please visit the Future Dairy website to read the complete version and feel free to download them.

Juan Molfino is about to start his post graduate studies with the Dairy Science Group. Look out for his first student update in the next newsletter.

Impact of Automatic Milking Systems (AMS) on labour and lifestyle on commercial farms in Australia - CASE STUDIES



Peter and Kathryn Costello, Tongala, Northern Victoria

Milk more cows in less hours

Key Points: Flexibility provides more family time, Less physically demanding work, Individual cow feeding boosts production, No employed labour



Crowden family, Western Creek, Tasmania

Converting a run off block to dairy without added labour

Key Points: 200-cow dairy farm operates with less than one full time equivalent, Heavy reliance on remote monitoring, Labour efficiency double the Tasmanian average



Crosby family, Conmurra, South Australia

Robots attract new entrants to dairying

Key Points: Ability to retain off farm employment, Pathway to succession, New entrants to dairy industry, No employed labour



Lindsay and Jacinta Anderson, Athlone, Gippsland

Batch milking with robots

Key Point: Significant reduction in employed labour, Reduced physical workload, An option that allowed continuation in the industry, Operating with batch milking



John, Caroline and Arjan van Adrichem, Togari, Tasmania

Robots improve labour efficiency, lifestyle

Key Points: Dramatic improvement in labour efficiency, Robotic milking attracts next generation back to dairying, Much improved lifestyle, Operates with family labour only

The impact of grain-based concentrate allocation and pasture state on intake and milk production in dairy cows grazing kikuyu and ryegrass pasture

By Ravneet Kaur

Low DM intake is a major limitation to milk production in pasture-based systems and pasture alone is insufficient to maximise production potential of dairy cows. Allocation of grain-based concentrate (GBC) to dairy cows based on individual cow requirements, rather than on a herd basis at a fixed rate increased milk solids yield by ~7% in a short term study (Garcia *et al.* 2007). This benefit was speculated to be due to improvements in the balance of the diet as cows that ate more NDF primarily in the form of maize silage also ate more concentrate.

In pasture-based automatic milking systems (AMS), due to the voluntary cow traffic and distribution of milking, dairy cows arrive at pasture at varying stages of depletion so that some cows access high quality fresh pasture compared to other cows which access low quality (higher NDF) depleted, higher NDF pasture (already grazed by other cows). Further, in AMS systems, GBC have been allocated independently of the pasture state. To date, the ability to increase feed conversion efficiency and AMS herd milk production by targeted GBC supplementation to cows grazing differing pasture states is unknown. Therefore, the objective of the current experiment was to determine the impact of kikuyu and ryegrass pasture state and GBC allocation on dairy cow intake and milk production.

Treatment	n	GBC	Pasture state	
			AM	PM
1	7	2.7	F	F
2	7	5.4	F	F
3	7	8.1	F	F
4	7	2.7	D	D
5	7	5.4	D	D
6	7	8.1	D	D
7	8	2.7	F	D
8	8	2.7	D	F
9	8	5.4	F	D
10	8	5.4	D	F
11	8	8.1	F	D
12	8	8.1	D	F

A group of 90 Holstein-Friesian cows were offered combination of four different pasture states and three different amounts of GBC (Table 1).

Table 1. The number of cows (n), pasture state (F¹=Fresh, D²=depleted) and grain-based concentrate (GBC) (kg DM/cow/day) offered for each treatment.

¹ allocation of 80kgDM/cow/day to ground level per cow, ²59kgDM/cow/day to ground level per cow

Pasture states comprised of either two consistent (namely fresh-fresh, and depleted-depleted) or two inconsistent (namely fresh-depleted, and depleted-fresh) pasture states offered after morning (AM) and afternoon (PM) milking respectively.

The GBC was offered half in the morning (AM) and half in the afternoon (PM) milking. Further, 3 cows within each of the 12 treatments (total of 36 cows in the herd) were randomly selected and dosed with synthetic alkanes to determine pasture intake. Rectal grab samples were collected twice daily after milking for 7 consecutive days and analysed for alkane content to determine pasture intake.

Data were analysed using linear mixed modelling in GenStat 14th Edition (VSN International, UK). The statistical model included the interaction between pasture and concentrate, using pre-experimental milk yield as a covariate. Cow and day were included as a random effect. Significance was determined if $P < 0.05$.

Kikuyu trial: There was an increase in milk production with increased GBC and there were differences in milk production with pasture state (Table 2 and 3). For cows accessing fresh, fresh pasture, there was 1.44 kg more milk produced than other pastures states. There was 1.65 kg more milk produced when GBC increased from 3 to 6 kg DM/d, and 3.01 kg more milk when GBC increased from 3 to 9 kg DM/d.

Table 2 Milk yield (L/cow/d) and Intake (kg DM/d) of cows offered different pasture states

Pasture state (AM/PM)	Milk yield		Pasture Intake	
	Kikuyu	Ryegrass	Kikuyu	Ryegrass
Fresh-Fresh	23.56 ^a	27.57 ^a	11.77 ^a	14.36 ^a
Depleted-Depleted	22.18 ^b	25.81 ^{bc}	8.02 ^b	9.94 ^b
Fresh-Depleted	22.02 ^b	25.42 ^b	9.20 ^b	10.14 ^b
Depleted-Fresh	22.16 ^b	26.76 ^{ac}	10.87 ^a	13.51 ^a

Superscript denotes means within columns are significantly different ($P < 0.05$)

The impact of grain-based concentrate allocation and pasture state on intake and milk production in dairy cows grazing kikuyu and ryegrass pasture (cont.)



Table 3 Milk yield (L/cow/d) and Intake (kg DM/d) of cows offered different grain-based concentrate (GBC) allocations

GBC (kg DM/d)	Milk yield		Pasture Intake	
	Kikuyu	Ryegrass	Kikuyu	Ryegrass
2.7	20.94 ^a	24.98 ^a	11.49 ^a	13.41 ^a
5.4	22.59 ^b	26.81 ^b	10.34 ^b	11.98 ^{ab}
8.1	23.95 ^c	27.39 ^b	8.06 ^b	10.57 ^b

#GBC was offered half in the morning (AM) and half in the afternoon (PM) milking; Superscript denotes means within columns are significantly different (P<0.05)

Pasture DMI was significantly higher in FF, FD and DF groups than DD group while pasture DMI increased with 2.7 and 5.1 kg DM/d than 8.1 kg DM/d of GBC.

Ryegrass trial: The change in pasture state and allocation of different amounts of concentrate significantly affected (P<0.001) milk production in cows grazing ryegrass pasture (Table 2). Within the consistent pasture allocation, there was 2.15 kg higher milk production in cows accessing fresh-fresh than depleted pasture, while there was higher milk production in cows accessing depleted-fresh compared to fresh-depleted within the inconsistent allocation of pasture. Milk production also increased by 2.41 kg when GBC increased from 2.7 kg GBC to 8.1 kg DM/d (Table 3).





There was an increase of 4.22 kg in herbage intake when cows were offered fresh-fresh pasture compared to depleted-depleted pasture in the consistent allocation, while there was a 3.57 kg increase in herbage intake with depleted-fresh pasture compared to fresh-depleted pasture (Table 3). There was a significant decrease in pasture intake (2.84 kg) when GBC offered increased from 2.7 to 8.1 kg DM/d (Table 3).

The results indicate that milk production increased with fresh, fresh pasture and with higher GBC levels. The lack of interaction in both trials suggests that cows can compensate their energy intake (and milk yield) either by grazing fresh pasture with lower amounts of GBC or by eating more GBC when grazing on depleted or stale pastures.

In conclusion, cows accessing consistently fresh pasture out produced those accessing depleted or inconsistent pasture allocations. Grain level had a clear positive effect on milk yield, but reduced pasture intake.

Similar milk yields were achieved by cows grazing fresh pastures (on average for all levels of GBC), or receiving highest level of GBC (on average for all states of pasture).

Reference

Garcia, S. C., Fulkerson, W. J., Nettle, R., Kenny, S., & Armstrong, D. (2007). FutureDairy: a national, multidisciplinary project to assist dairy farmers to manage future challenges - methods and early findings. *Australian Journal of Experimental Agriculture*, 47(9), 1025-1031.

For more information please contact Ravneet at ravneet.jhajj@sydney.edu.au.

Behaviour of Dairy Cows Grazing Variable Pasture States and Grain-Based Concentrate

Dr Ravneet Kaur



In pasture-based robotic milking systems, due to the distribution of voluntary cow traffic, dairy cows access different states of the pasture. The first cows moving into a fresh pasture allocation are offered high quality fresh pasture than the last cows accessing poorer quality stale (depleted) pasture with high fibre (neutral detergent fibre, NDF) and low protein content.

Moreover, concentrate is offered independent of the pasture quality. Understanding cow behaviour in response to different pasture states and concentrate allocation is needed to develop management strategies in robotic systems.

Therefore, the aim of the current experiment was to determine the impact of pasture state and concentrate allocation on cow behaviour in summer and spring.

Ninety mid-lactating dairy cows were offered 4 different states of kikuyu grass (*Pennisetum clandestinum*) in summer after am and pm milking sessions along with 3 concentrate allocations (3 kg, 6 kg and 9 kg /day). The 4 different pasture states comprised of 2 consistent (fresh-fresh or stale-stale) and 2 inconsistent (fresh-stale, and stale-fresh) pasture allocations.

After 6 days of adaptation, 36 cows (3 from each treatment) were selected for visual monitoring of grazing behaviour (15 minute intervals). The experiment was repeated in spring with ryegrass (*Lolium multiflorum*).

Samples were collected from both trials for each pasture state to determine in-vitro dry matter digestibility and nutrient composition.

Behaviour of Dairy Cows Grazing Variable Pasture States and Grain-Based Concentrate (cont.)

ASReml with R software was used to study interactions between pasture states, concentrate level and time of day.

We found a significant interaction ($P < 0.001$) between pasture state and time because of the diurnal variation in the grazing and lying behaviour but not ($P > 0.05$) for rumination behaviour. There was no ($P > 0.05$) interaction between pasture state and concentrate allocation on cow behaviour grazing ryegrass or kikuyu. On average, there was a higher probability of cows being observed grazing (0.43 vs. 0.37) and lying (0.43 vs. 0.37), and a lower probability of being observed ruminating (0.37 vs. 0.41) with ryegrass (spring) compared to kikuyu (summer) respectively (Figure 1). These differences could be related to higher in vitro digestibility (73% vs. 68%) and lower NDF content (50% vs. 65%) of ryegrass compared to kikuyu respectively.

In conclusion, behaviour patterns were affected by pasture type but the biggest effect was the time of day.

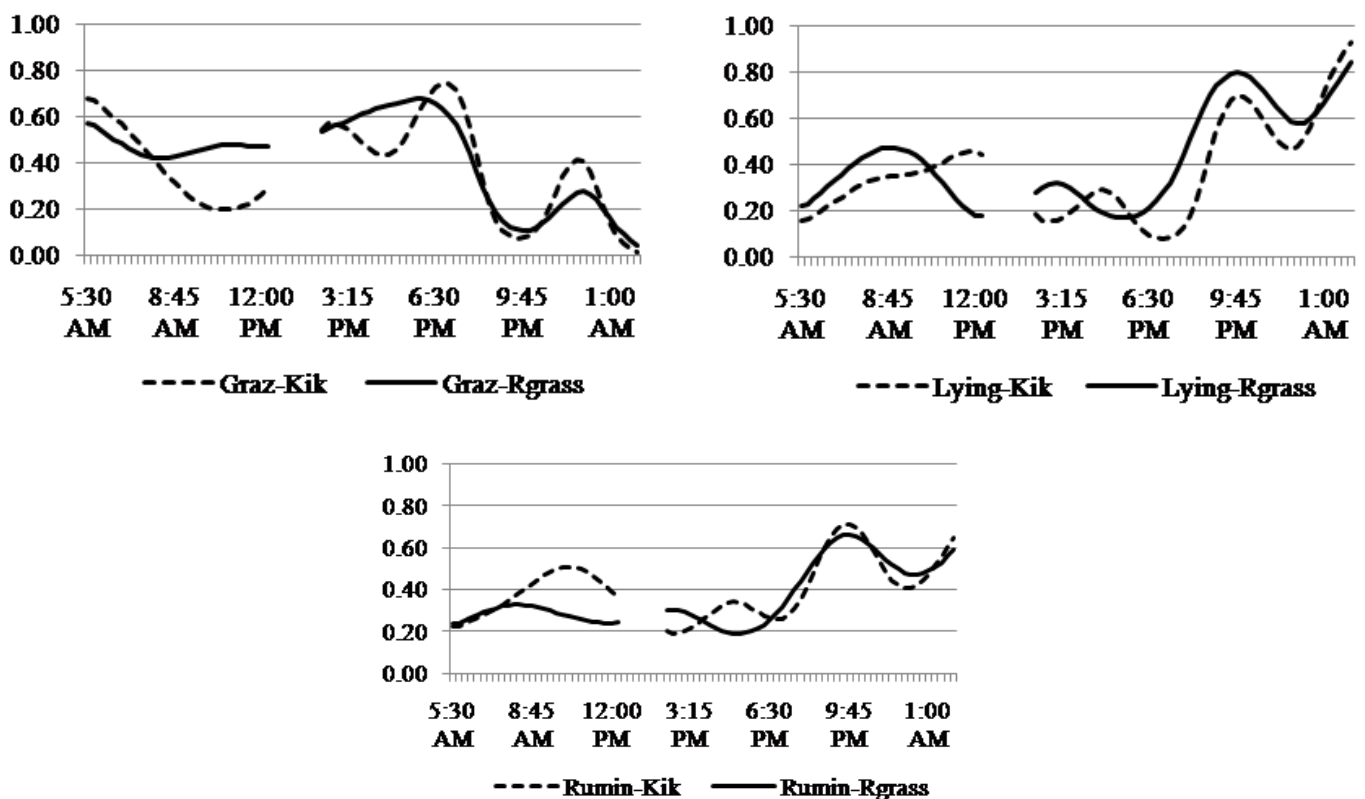


Figure 1. Mean grazing, lying and rumination behaviour of cows grazing kikuyu in summer and ryegrass in spring

Alex John *PhD Student*



How time flies, I feel like it was only the other week that I was writing for the newsletter so I'm sure three years is going to be over in the blink of an eye now that I am settled into my PhD.

I've spent many days in the office so far planning, reading and planning some more as I decide what path to head with my studies.

This was broken up by a short trip to the Hunter Valley for the Dairy Research Foundation Symposium, which I look forward to presenting at next year.

At the moment I have a couple of projects on my radar. The first is a review of AMS farmers' pasture management practices and robot utilisation achieved on farm. I think there is a lot of interesting data that we can take from the historic robot utilisation data of commercial AMS farms.

I've been analysing historical data and have found some interesting patterns of cow behaviour which I think we can learn a lot from with some further research. If we are able to identify certain cows that follow distinct behavioural patterns then we may be able to better manage them within the system by knowing what drives their particular behaviour pattern.

The other project that I have in planning is a behavioural study of cows on commercial AMS farms.

I'm aiming to work with some farmers in the coming months with these studies where I hope to do some visual observation and GPS tracking of cow behaviour.

These two pieces of work will form the basis of my PhD studying the interactions of cows and feed to optimise robot utilisation.



POST GRADUATE UPDATES



Saranika Talukder *PhD Student*

Saranika has now settled in Wagga Wagga and looking forward to life as a new mum. As her thesis comes together, she has provided a snapshot of one of her pieces of research below. We look forward to the full paper being published.



CHANGES IN PLASMA OXIDATIVE STRESS BIOMARKERS IN DAIRY COWS AFTER OESTRUS SYNCHRONISATION WITH CONTROLLED INTERNAL DRUG RELEASE & PROSTAGLANDIN F_{2A}

This study was designed to evaluate the plasma profiles of oxidative stress biomarkers, progesterone and ovarian follicle diameter in ovulatory versus an-ovulatory cows. Twenty cows were synchronised using controlled internal drug release (CIDR) and prostaglandinF_{2α} (PGF_{2α}) protocol. Plasma samples were analysed for progesterone (P4), oxidative stress (OS) biomarkers; reactive oxygen metabolites (ROMs), biological antioxidant potential (BAP), oxidative stress index (OSI = ROMs/BAP × 100), advanced oxidation protein products, ceruloplasmin and glutathione (GSH).

Plasma P4 concentration was greater in ovulated cows 24 hours (h) after PGF_{2α} treatment but lower 48 h after PGF_{2α} treatment compared with that of an-ovulated cows at those sampling sessions ($P < 0.05$). Ovulated cows were diagnosed with greater ovarian follicle diameter compared with that of their herd mates not diagnosed for ovulation. Significant interaction of time of PGF_{2α} treatment and ovulation status (ovulatory versus an-ovulatory) with the plasma concentrations of OSI, BAP and GSH were observed. Ovulated cows had significantly lower BAP compared with that of an-ovulated cows ($P < 0.05$) 9 h, 48 h, 60 h and 128 h after PGF_{2α} treatment. Plasma concentrations of GSH were lower ($P < 0.05$) in ovulated cows than that of an-ovulated cows 60 h and 96 h after PGF_{2α} treatment. However, OSI was greater ($P < 0.05$) in ovulated cows than that of an-ovulated cows 9 h, 48 h, 60 h and 128 h after PGF_{2α} treatment. Significant associations were observed between OS status and sampling time. Oxidative stress status may have important physiological role in facilitating the ovulation process in oestrus synchronised dairy cows.

This paper has been accepted for publication in Animal Production Science.

POST GRADUATE UPDATES



Tori Scott PhD Student

I am very rapidly coming to the end of my candidature as a research student with FutureDairy. My PhD was designed to investigate the effect of various incentives on voluntary cow traffic (cows moving around the farm system with minimal human assistance) in pasture-based AMS, and particularly in the robotic rotary system.

I have conducted a total of four field experiments throughout my studies, of which I looked at the effect of various feed types, quantities and locations (in respect to milking, i.e. feed offered before, after or during milking, as well as within the dairy facility or outside at pasture) on voluntary waiting time (the length of time in which a cow can freely volunteer for milking once she has entered the pre-milking area, ignoring any time in which the cow was forced to wait – e.g. if there was maintenance activities occurring, or a mechanical failure) and cow traffic throughout the farm system.

From this work I have been able to assist in contributing to the knowledge we currently have surrounding pasture-based AMS. My most rewarding/favourite experiences along the way have been building relationships with farmers and being able to witness how the work I, along with our research group, have conducted has been of benefit to the industry. I am very grateful for these experiences and the opportunity to develop skills that will be useful in whatever path my future holds for me.

Results update: In a retrospective study from data collected in a previous study comparing cow traffic when cows were offered supplementary feed either before or after milking in AMS, I investigated whether there were any differences between cows that consistently spent short (≤ 65 min), mid (66-119 min) or long (≥ 120 min) periods of time in the pre-milking yard prior to voluntarily presenting for milking. In order to 'group' cows into one of these three categories, I had to calculate the median waiting time for each cow, and use this median value to place each cow into a group.

Tori Scott *cont.*

After analysing the data and determining the probability of a cow being in any one of the mentioned groups, results indicated that management factors influenced which group a cow was likely to be in. The probability that a cow was a 'long' waiter (≥ 120 min) increased when the number of individual milking events that were related to a cow being fetched from the paddock prior to entering the pre-milking yard, or manually encouraged onto the milking equipment, increased. Cows that were observed in active behaviours (e.g. alert or walking) were more likely to be 'short' waiters (≤ 65 min). Interesting, production traits (e.g. milk yield, parity and stage of lactation) did not impact which group a cow was likely to be in.

The next step now is to determine how to manage cows that are identified as 'slow traffickers'. It will be difficult to completely eliminate management practices such as fetching from the daily activities of an AMS, despite them being linked with 'long' waiters since these practices are needed to minimise extended milking intervals and ensure that cows don't skip returning to the dairy before gaining access to new paddocks (i.e. that all cows have exited a stale paddock before a fresh paddock becomes available).



Tori presents her research to the audience at the 2014 Symposium

While the risk of being a 'long' waiter was higher for cows that were encouraged onto the milking equipment, it is likely that encouraging the cows was not causing them to be long waiters, but rather that it was an effect of them already having waited a long time. A currently untested strategy to manage slower traffickers could be that of a priority laneway at the dairy, where slow traffickers could be given the opportunity to present for milking and leave the dairy without having to compete with the remainder of the herd in the main waiting area (i.e. have more direct access to the milking equipment). In testing the effect of a priority lane on cow traffic, it will be important to determine how large the laneway should be, as well as how many cows can be sent to it (we know that queue length (number of cows in the yard) dramatically influences cow traffic, therefore sending too many cows in proportion to the overall herd size will likely neutralise the benefits of having a priority laneway).

Ashleigh Wildridge *PhD Student*



It is amazing how many changes can occur in a few short months, but since the start of my PhD this year, I am now onto my fourth (and final) overall theme for my thesis! My PhD has changed from one looking at using feed incentives to manipulate cow behaviour, to now having a focus on the use of technology and infrastructure to improve the wellbeing and productivity of cows on pasture based automatic milking systems (AMS).

Although I am yet to leave my desk, plans are well underway to begin my first trial within the next two months. Here I will be looking at the behaviour of cows on a voluntarily trafficking AMS farm in response to being fetched late at night.



This is being done due to the nature of three-way grazing systems, where cows that haven't voluntarily moved need to be fetched to avoid having excessively long intervals between being milked (which can negatively impact on production and increase the risk of mastitis).

Having three daily pasture allocations means that one of the ideal fetching times falls in the middle of the night. Most farmers delay this until the morning which is not a major issue, but can result in some cows having undesirably long milking intervals. I will look into how the cows respond to late night fetching (with the anticipation of future automation of fetching).

If all goes well, we expect that it will help to alleviate long milking intervals and that it will also result in improved utilisation of the milk harvesting equipment during the early hours of the morning (a time that is typically associated with lower throughput).

Thanks

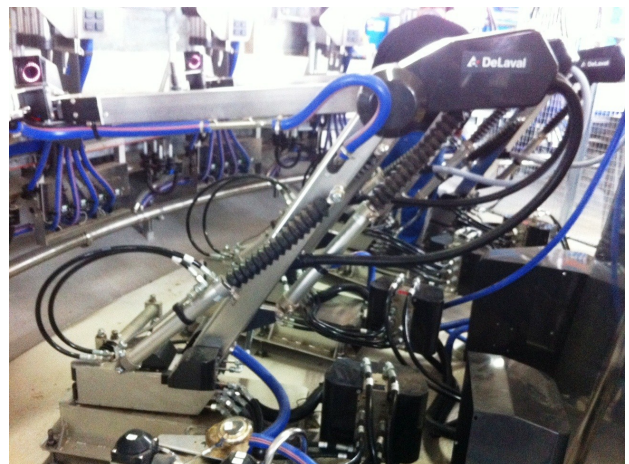
Ash

CAMDEN FARMS

Since the last newsletter, Camden Farms has had a lot of impressive changes implemented.

The biggest and most exciting is the completion and commissioning of the Automatic Robotic Rotary (DeLaval AMR). The rotary has had its first cows go through in the past few weeks and the Camden Farms Team are now starting to transition the 380 cows across from the existing herringbone dairy. The cows will be taught to volunteer themselves for milking twice a day.

This 'cow training' is an integral part of the success of the system and will be the focus of the farm staff over the next few weeks. The team at Corstorphine have a huge but exciting task ahead of them. Open days are expected to be scheduled once the system is running smoothly.



Kim McKean was recently awarded a 'Pride of Workmanship' award by the Rotary Club of Camden. The Dairy Science Team had the honour of seeing Kim presented this award at a dinner held at the Camden Sports Club. Kim was joined Karen Black from the Universities Camden Library in receiving this award and we'd like to congratulate them both on this very well deserved recognition!



Kim McKean (L) and Karen Black (R) are presented their Pride of Workmanship awards by former Camden Rotary President Aneek Mollah



For further information please contact Farms Manager Kim McKean at kim.mckean@sydney.edu.au

VISITORS TO CAMDEN

Jeroen Olijslager



We have recently said goodbye to Jeroen Olijslager who has been working with the Dairy Science Group (DSG) for a number of months.

Jeroen came to work with us from HAS University of Applied Sciences in the Netherlands as part of his studies.

His research program involved the using data captured through the NSW DPI Farm Monitor Project working with Nicolas Lyons and Kerry Kempton.

Whilst here Jeroen also had the opportunity to attend the DRF Symposium in the Hunter Valley, NSW and spend 2 weeks working with Kerry in the region. He ended his trip to Australia with a few weeks touring Queensland Tropical North.

The DSG enjoyed hosting Jeroen and we wish him the very best with his studies and ensuing career.



Vicki Timbs of Murray Goulburn Co-op during question time at the 2014 Symposium. PhD student Ahleigh Widridge and Jeroen Olijslager contemplate the questions being asked.



MOST RECENT SCIENTIFIC PAPERS

ACCEPTED AND IN PRESS

Clark, C.E.F., Kwinten¹, N.B.P., van Gastel, D.A.J.M, Kerrisk, K.L., Lyons, N.A., Garcia, S.C. (2014). A breed comparison of voluntary cow traffic in a pasture-based automatic milking system. *Asian-Australasian Journal of Animal Sciences* (In press).

Clark, C.E.F. (2014) Dairy Farmer Z. Proceedings of the Dairy Research Foundation Symposium, The University of Sydney, Camden. 19: 26

Garcia SC, Islam, MR, Clark CF. Martin P (2014). Kikuyu-based pasture for dairy production: a review. Invited review to *Crop and Pasture Science*. (<http://www.publish.csiro.au/paper/CP13414.htm>)

Golder HM, Denman SE, McSweeney C, Celi P, Lean IJ. (2014) Rumina bacterial community shifts in grain, fructose, and histidine challenged dairy heifers. *Journal of Dairy Science* (Accepted).

Islam MR, Garcia SC (2014). Prediction of Dry Matter Yield of Hybrid Forage Corn Grown for Silage. *Crop Science* doi: 10.2135/cropsci2013.10.0710 (in press).

Kerrisk, K. (2014) Should anyone build a new dairy with a robot? Proceedings of the Dairy Research Foundation Symposium, The University of Sydney, Camden. 19: 42

Scott, V.E., Kerrisk, K.L., Thomson, B. and Garcia, S.C. (2014) Inside the mind of the cow: understanding voluntary cow traffic behaviour in a pasture-based automatic milking system. Proceedings of the Dairy Research Foundation Symposium, The University of Sydney, Camden. 19: 66.

Scott, B.A., Camacho, A., Clark, C.E.F., Golder, H., Molfino, J., Kerrisk, K.L., Lean, I., Garcia, S.C., Chaves, A. and Hall, E. (2014) The impact of milking order on the quality and quantity of pasture accessed. Proceedings of the Dairy Research Foundation Symposium, The University of Sydney, Camden. 19: 73

Talukder, S., Kerrisk, K.L., Clark, C.E.F., Garcia, S.C. and Celi, P. (2014) Rumination patterns and locomotion activity in a dairy cow diagnosed with left displaced Abomasum (lDA): A case report. Proceedings of the Dairy Research Foundation Symposium, The University of Sydney, Camden. 19: 91

Molfino, J., Kerrisk, K.L., Garcia, S.C. (2014) Impact of Automatic Milking Systems (AMS) on labour and lifestyle on commercial farms in Australia. Proceedings of the Dairy Research Foundation Symposium, The University of Sydney, Camden. 19: 105.

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