



THE UNIVERSITY OF  
**SYDNEY**

# **Dairy Research Foundation**

Newsletter, Volume 9 - Issue 1  
October 2017



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## From the President

The DRF Symposium is my favourite dairy event. I haven't missed one in over 25 years. It's a great time to catch up with old dairy friends and at the same time get access to the latest thinking on research and future trends in the Industry.

The lead speaker this year was Josè Santos from Florida University.

Josè tackled what to me is the biggest challenge in dairying, which is how to have high producing cows, with good components, that go easily back in calf.

I had already met Josè and knew we were going to receive a terrific talk and was not disappointed. The trip to sunny Port Macquarie was well worthwhile.

*Regards*

*Bill*



# Directors Report

Welcome to the DRF Newsletter!

The 2017 Dairy symposium was another great success, with an impressive mix of farmers, researchers and students speakers. The feedback we received was amazing, with 94% of the almost 200 delegates rating the event as excellent or very good!

On the research front, in June we finished the last phase of the FutureDairy, a project that commenced in 2004 and has already gone through 4 phases..!

The group is in discussions with investors for the next phase, which will take a bigger focus on extension and training, without a direct research component.

So while FutureDairy research has wound up alongside a decline in dairy industry-funded research for the group, new projects, new ideas and new collaborations keep popping up.

New projects in virtual herding (RRD4P) and animal welfare (MLA-DC) are underway under the leadership of Dr Cameron Clark and Dr Sabrina Lomax; and the new The

University of Sydney Institute of Agriculture, launched officially on 27th September with tremendous success.

These will undoubtedly bring new horizons and opportunities for increased collaboration and multidisciplinary research.

We remain very positive for the future and we will continue to contribute to a sustainable and vibrant dairy industry through scientific research.

Have a look inside for more details on the symposium and the latest research by staff and PhD students.

*Regards,*

*Yani*



# ADSS 2016

Animal Production Science have recently published nearly 50 papers from the Australasian Dairy Science Symposium (ADSS) which was held in Sydney in November 2016 in a special edition.

Full text and PDF's are available online in Volume 57, Number 7 2017.

[Click here](#) or on below image to access the ADSS Special Edition.



AUSTRALASIAN DAIRY SCIENCE SYMPOSIUM 2016: SCIENCE-BASED SOLUTIONS FOR AUSTRALASIAN DAIRY INDUSTRIES

THE UNIVERSITY OF SYDNEY, 16-18 NOVEMBER 2016

GUEST EDITORS: SERGIO C. GARCIA, JOEL L. JACOBS

- WELFARE AND INTENSIFICATION
- COWS, PLANTS AND INTERACTIONS
- FARM ECONOMICS AND SYSTEMS
- FEED AND FEEDING SYSTEMS
- SOILS AND ENVIRONMENT
- PHYSIOLOGY, NUTRITION AND HEALTH
- TECHNOLOGY, DATA AND AUTOMATION

# 2017 Symposium

Port Macquarie on the mid north coast of NSW was the absolutely beautiful location of our recent dairy symposium.

The DRF team took the event on the road once again and delegates enjoyed 3 days of fantastic weather, great venues and a wonderful program.

Keynote speaker, José Santos from Florida University, presented the latest research into reproductive performance of the modern dairy cow.

## **Symposium Keynote speaker:**



Prof. José E Santos,  
Florida University

*Key points from Prof Santos' talk were:*

The trend in decline in fertility has been reversed: measures of reproduction have improved in the last 15 years.

This is due to a combination of better management practices in nutrition, peripartum health, reproduction and more recently, genetic selection for health and fertility.

For Holstein cattle (>90% of the cows in USA), the average calving interval has shortened by 27 days in the last decade (from 423 days in 2005 to 401 days in 2014).

This means that the interval calving-conception (days open) is currently at approximately 123 days.

Meanwhile, milk production per cow has continued to increase at 1.3% per year

In his keynote address, Prof Santos expanded on all the above points with lots of examples and in clear language that engaged all the farmers in the audience.

You can find more details in the full paper published in the [2017 DRF Proceedings](#).

## Dairy Science Award



*Dairy Science Award Winner Kendra Kerrisk with Dairy Connect representative George Davey*

The Dairy Science Award was presented to Kendra Kerrisk recently at the DRF Symposium.

Kendra's work within the dairy industry in both her native New Zealand and Australia has been highly acclaimed and well received worldwide.

Kendra has developed into an internationally recognised leader in the field of milking automation over the past 11 years and prior to joining the FutureDairy project was a well respected researcher with DairyNZ.

With the latest phase of the FutureDairy project coming to end, Kendra has made the decision to leave the University to pursue personal business interests.

This award highlighted just how much Kendra has done for the industry and the huge void her departure will leave within the industry.

Whilst we are genuinely saddened to see her go, Kendra has the best wishes of the Dairy Science Team and we know she will make a success of her new enterprise!



# Emerging Scientist Program

The 2017 group of early career scientists had a few familiar and some new faces present to the delegates on Farm Day at the Symposium.

The overall Best Presentation went Jo Newton (below left) from Agriculture Victoria with her work on high genetic merit cows and their impact on profit. Jo's aim through her research is to equip dairy farmers with the tools and knowledge to make quick, clever decisions to increase herd performance and farm profitability.

Runner Up for the presentations was Beth Scott (below centre) who is doing her Masters with

Wageningen University to dispel the myths and truths in the prevalence of stillborn calves.

Best Paper was awarded to Alexandra Green (below right) from Sydney University who is researching diet modifications and has an interest in working to help mesh together precision technologies and agricultural production systems.

The Emerging Scientists Program is enthusiastically attended each year by delegates and it is inspiring to see the high level of young researchers coming through in Australia!



Best Presentation Winner Jo Newton (left), Runner Up Beth Scott (middle) and Best Paper Winner Ali Green (right)

# Symposium Gallery





# Optimising calf rearing and weaning by monitoring the real-time development of rumination

## Optimising calf rearing and weaning by monitoring the real-time development of rumination

S. Butler, P. Thomson, S. Lomas, C. Clark  
Dairy Science Group, School of Life and Environmental Sciences, Faculty of Science, The University of Sydney  
cameron.clark@sydney.edu.au

### Abstract

Optimising calf rearing and weaning by monitoring real-time sensor-derived rumination development presents an opportunity to substantially improve animal health and productivity whilst reducing on-farm costs. Here we show the potential to monitor calf rumination using existing algorithms and for the first time, the detailed development of rumination and its variability between individuals. Observed and sensor derived rumination levels were associated ( $P < 0.001$ ) with rumination commencing at approximately 14 days of age. However, a high level of variation was found between individual calves in both observed and sensor derived rumination levels and the development of rumination. Whilst differences in rumination development between calves may, in part, be associated with sensor performance, our work shows the potential to use remotely monitored rumination levels to customise feeding and health at an individual level to optimise the weaning process.

**Keywords:** validation, rumination, sensor, dairy, calf, weaning

### Introduction

The Australian Dairy Industry is evolving from smaller family owned and managed farms into large scale more intensified systems (Torstein et al., 2014). The move to larger farms means that optimising the performance of the individual animal, while maintaining animal welfare is becoming increasingly difficult. In order to maintain or improve levels of productivity from these systems, our focus needs to shift rapidly from the herd to optimising individual animal processes through technology assisted management. Calves form the basis of any successful cattle production system, with calf health and development vital for ongoing animal performance and farm profit (Gulliksen, et al., 2009). However, it is this rearing stage of a dairy animal's life, and in particular the initial month which requires the most significant investment, including veterinary and feeding expenses and higher mortality risk (Ortiz-Pelaez et al., 2008). With efficiency a key driving factor in the success of

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health and productivity whilst reducing on-farm costs.

Here we show the potential to monitor calf rumination using existing algorithms and for the first time, the detailed development of rumination and its variability between individuals.

Observed and sensor derived rumination levels were associated ( $P < 0.001$ ) with rumination commencing at approximately 14 days of age.

However, a high level of variation was found between individual calves in both observed and sensor derived rumination levels and the development of rumination.

Whilst differences in rumination development between calves may, in part, be associated with sensor performance, our work shows the potential to use remotely monitored rumination levels to customise feeding and health at an individual level to optimise the weaning process.

For a copy of the full paper please follow the below link.

[Conference Paper](#)

Sabrina Lomax recently presented the following paper to the delegates of the 8th European Conference on Precision Livestock Farming (EC-PLF).

The research behind it was done as part of an honours project in 2016 headed by Sancha Butler.

*Some of the key points that came from this research are as follows:*

Optimising calf rearing and weaning by monitoring real-time sensor-derived rumination development presents an opportunity to substantially improve animal

# Virtual Herding Experiments Underway

Dr Sabrina Lomax and Dr Cameron Clark

Experiments for The University of Sydney component of the 'Enhancing the profitability and productivity of livestock farming through virtual herding technology' project have commenced.

This project is supported with funding from the Australian Government Department of Agriculture and Water Resources, as part of its Rural R&D for Profit programme.

This program of work is a collaboration between USYD, CSIRO, Tasmanian Institute of Agriculture, University of New England, The University of Melbourne and Agersens Pty Ltd, and involves the dairy, beef, wool and pork industries and their respective RDC's; Dairy Australia, Meat and Livestock Australia, Australian Wool Innovation and Australian Pork Limited.

The USYD subprogram is focused on determining the best sub-herd and individual animal management for dairy and beef production systems.

Virtual herding (VH) allows for the control of animal location to a predefined area or boundary without

the use of ground-based or physical fencing. VH relies on associative learning of cattle to cues administered from a collar mounted device.

In the context of the current project, cows receive an audio tone when they approach the VH boundary; if they continue forward they receive a mildly aversive electrical stimulus.



*A cow, wearing a manual version of the collars, receives her pellet reward in the test laneway*

The first USYD experiments will focus on defining the individual animal variation in behavioural response and learning of these VH cues. This will enable us to determine the need or protocol for training of cattle to VH, for improved efficiency and value when implemented in a commercial system. Experiments will continue throughout the year, and we will be providing updates along the way.

Sabrina presented results at the DairySA Innovation Day in June in Mt Gambier, and has just arrived back from presenting at the 7th International Conference on the Assessment of Animal Welfare at Farm and Group Level (WAFL) and the 8th European Conference on Precision Livestock Farming (EC-PLF).

For more information – contact Sabrina Lomax by email at [Sabrina.lomax@sydney.edu.au](mailto:Sabrina.lomax@sydney.edu.au)

*Cows lining up for their turn to enter the test laneway*



# Post Graduate Updates

## Momena Khatun

I am nearly half way through my PhD now! Since last newsletter there are few events to share with all.

Let's start with the beginning of the year. I met farmers, international and national researchers at the Australian Dairy Conference held in Adelaide in February. I was one of 6 selected young scientists to share my research findings on “improving mastitis detection in Automatic milking systems” with scientists from different parts of Australia, USA, New Zealand, China, The Netherlands and Saudi Arabia. I have also learned about co-operative farming system, bio-gas plant management system of GAE, pasture management and the driving force of cheese industry in southern Australia.

It was a wonderful experience indeed! The 2nd international conference I attended this year was the “The American Dairy Science Association (ADSA)” in Pittsburgh, Pennsylvania (<http://m.adsa.org/2017/>). I was one of more than 1,900 dairy scientists from 48 countries and my talk was on “Clinical mastitis detection –



*Mona (left) with former student Rachael Rodney at the Australian Dairy Conference held in Adelaide in February*

development of an accurate detection method for automatic milking systems”. The ADSA meeting is arguably the most important scientific gathering for dairy researchers, bringing in many internationally-renowned speakers and this meeting allowed me to meet experienced dairy scientists and thereby networking, and personal development which are important milestone during my doctoral training in Australia.

The last but not least conference I have attended this year is Dairy Research Foundation's 2017 Symposium in Port Macquarie.

It is very motivating to learn what other young dairy scientists are researching and understanding farmer's expectations.

My first paper "Early detection of clinical mastitis from electrical conductivity data in an automatic milking system" has been recently published in Animal Production Science journal; and my second paper is ready for submitting to the in the Journal of Dairy Science. In this paper the role of different AMS

measurements related to electrical conductivity, milk yield, milk flow and milking frequency as potential indicators of clinical mastitis in AMS will be addressed. I am also finishing my field study to investigate the role of lactate dehydrogenase, serum albumin and SCR HR-LDn activity, together with sensor information for better and earlier detection of mastitis in AMS. More findings about my research will be available on the upcoming newsletters.

## Juan Molfino



So far, 2017 has been busier than ever for me. Very happy to announce that early this year the paper title 'Evaluation of an activity and rumination monitor in dairy cattle grazing two types of forages' was published in Animal Production Science. Follow the link to access it: <http://www.publish.csiro.au/an/pdf/AN16514>.

I'm currently analysing all the data of a field trial that I conducted last year

in Corstorphine Dairy Farm, in which 2 different groups (efficient and inefficient) of cows were fitted with gps and the already validated activity and rumination monitors, and were monitored for 10 days.

The aim of this research trial was to characterize the behaviour and performance of cows with different level of efficiency in pasture-based automatic milking systems, in order to create guidelines to better manage them to increase efficiency and productivity. Preliminary results are very promising!

In late March 2017 I had the opportunity to attend the First Grassland Robotics Convention organized by DeLaval that was held in Launceston, Tasmania.





There were participants from all over the world, including Australia, New Zealand, Ireland, UK, Argentina, Brazil and Chile. It was a 3 day event where I participated in a workshop on cow traffic, pasture and feed management; we visited several farms and also attended various presentations of farmers, scientists and experts in robotics.

It were a great couple of days in which we discussed about the current situation of the robotics systems, some

of the main challenges AMS farmers are facing and how are they managing them, which are some of the new technologies coming on board amongst others topics.

With the beginning of the semester at School of Life and Environmental Sciences I started doing some teaching and running some field days Corstorphine Dairy Farm for first year students of various degrees. For many of them it's their first time on a Dairy Farm and I really enjoy giving them an Introduction to the dairy industry.

Just recently I prepared a paper and presentation to participate in the 2017 Dairy Research Foundation Emerging Scientist Competition. The event was held in Port Macquarie (NSW) on July 25, 26 and 27th.

*Juan (far right) and a group of delegates at the Grassland Robotics Conference*



## Alex John



Being my final year of PhD studies, I am currently busy writing up the many results I have accumulated over these past couple of years.

The preliminary results of my latest and final study, completed in collaboration with the University of Melbourne at their Dookie research farm, have shown promise.

Here, we were looking to manipulate the 24 h robot utilisation patterns of the farm by offering different amounts of feed in each of the three daily pasture allocations.

We offered three treatments, one, offering the same quantity of pasture in all three allocations, two, offering more pasture in the daytime allocations (i.e. matching a cows

diurnal feeding patterns), and three, offering more pasture in the night time allocations (i.e. inverse to a cows diurnal feeding patterns). Keep an eye out for the from that study in the near future.

I also had an abstract accepted for the DRF symposium that was held in Port Macquarie in July.

My research on the impact of feed type and quantity on the diurnal feeding patterns of dry dairy cows (outlined in the last newsletter) was the focus of my presentation which was very well received by the audience.

It was my fourth, and perhaps last, DRF symposium and another great experience for me!

## Alexandra Green

I am now in the 2<sup>nd</sup> year of my PhD and what a year it has been so far! I started off 2017 by going on a trip to Europe to visit some of the top scientists in my field.

In Switzerland and England I had the privilege of meeting with a team of animal bioacousticians who showed me how to acoustically and statistically analyse my cattle vocal data.

I then visited dairy scientists in Sweden who helped me refine my experimental designs. It was so interesting to see the dairy production systems in Europe, especially in the middle of freezing winter when the cattle are all indoors! The whole trip was very worthwhile and has enabled me to setup collaborations for my future experiments.

Since returning I have begun conducting some pilot experiments on 20 Holstein-Friesian dairy heifers. I am recording their vocal behaviour in response to social isolation, oestrus, feeding and yarding.

I am also video recording them so I can do an in-depth behavioural analysis, and measuring their heart

rate so I can compare behaviour to physiology.

So far I just have preliminary results but it seems as if the cows have individually distinctive voices and their call type changes with context. Hopefully by the next newsletter more results will be made available!



*Ali Green (above) tests some of the equipment being used for her trials and shows how seriously she takes 'cowmoonication' with fellow student Ashleigh Wildridge (below)*



## Meaghan Douglas



In the last newsletter we were just gearing up for a couple of experiments, and in this newsletter I can happily report that they were successfully completed!

I completed another nylon bag experiment in March investigating the degradation characteristics of perennial ryegrass, this time looking at pasture harvested in summer during the reproductive stage of its life-cycle. A total of 594 bags were individually weighed, filled with pasture and incubated over a

two-week period. This data has just been returned and is now being collated for statistical analysis.

The data will complement my results from last year's experiment, where 750 nylon bags were analysed – totalling just under 1,350 bags in 12 months, I even see nylon bags in my dreams!

There were differences in the amount of protein degraded in the rumen between the early spring perennial ryegrass cultivars within regions of Victoria – Bealey NEA2 had the greatest amount of total protein available for degradation in the rumen in northern Victoria, and Vic Rye (Victorian SE) had the greatest amount in south-west Victoria.

This information was published in an article in the DairyDirect magazines.

*Cows munching on their hay following the afternoon milking on the trial site*



I am keen to see if there are any differences between the cultivars harvested in summer, and if there is see if they vary in a similar way compared with the same cultivars in early spring.

We have also completed another grazing experiment at Ellinbank, this time held in autumn (April). This experiment again tested four supplementary grain treatments to determine the most optimal diet to

feed to grazing dairy cows in autumn.

We added in supplementary forage as hay in the paddock during to supplement these cows as pasture mass wasn't high during this experiment (image included).

Our next experiment starts in mid-late August, and will test dietary treatments for grazing dairy cows in early lactation.



*Getting nylon bags weighed and ready for incubation*

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## Ashleigh Wildridge



I am in the final stages of my PhD now, with one paper published, another paper submitted, and another five papers not too far behind them.

Data analysis is mostly complete, so all of my attention is now on writing!

The last project that I finished was looking at the transition of dairy farms from conventional to automatic milking.

I was lucky enough to get the opportunity to work with five great farms in NSW, Vic and Tas for this project, meeting some great farmers and seeing first-hand how different farmers are managing their farms during this transition phase.

I found it very interesting talking to the farmers during this time and seeing how they all view the

transition process and their thoughts on the changes they experienced.

The results of this project have been exciting to explore, and were presented at the 2017 Dairy Research Foundation Symposium in July this year.

For this project, I wanted to find out if there is truth behind the anecdotal comment that AMS cows are quieter than conventionally milked cows.

After following these five farms over two years that were converting to AMS, the data I collected seems to agree with that anecdotal statement.

Not only did the farmers spend less time interacting with the cows in the AMS, the cows actually still appeared to be less fearful of humans.

So it seems that the removal of farmers for milk harvesting might not just change farmer lifestyle but also the dynamics of farmer-cow interactions.

I enjoyed attending my last DRF symposium as a student this year

and having the opportunity to present this research to the dairy industry. It was great to listen to all the latest dairy research from the presenters and to see what all the other emerging scientists are up to.

## Mardhati Binti Mohammed

I commenced my PhD at the University of Sydney in March this year under the supervision of Prof. Yani Garcia.

I was born and raised in Negeri Sembilan, Malaysia.

My MSc Degree in Food Science is from National University of Malaysia (UKM). Presently, I am on study leave from my work in Malaysia, where I work as a Senior Research Officer in Animal Feed Programme at the Animal Science Research Centre, Malaysian Agricultural Research and Development Institute (MARDI), Selangor.

My PhD project aims to develop a robust technique to better quantify the individual intake and diet composition of grazing dairy cattle through combining and comparing the different techniques including the n-alkane technique, develop an



intake model and through the usage of current sensor technology. It could provide a better/practical solution to the dairy industry in estimating the individual intake of the animals in order to have a better feeding plan for their animals.

I am now doing the scientific literature review to fully understand the topic and to get a better idea on planning and conducting my research project.

*The Dairy Science Team would like to welcome Mardhati and her family to Camden!*

# Visitors to Camden

Juan Ignacio Gargiulo



Hi, my name is Juan Ignacio, I'm from Argentina and I was here in Camden doing a four month research internship with the Dairy Science Group. Here is a bit of information about me, my background and why I came to Australia!

I've always been interested in the Australian dairy industry, particularly pasture based dairy systems and automation.

After completing a Bachelor in Agricultural Science and a Postgraduate degree in Dairy Science in my country, I started my professional career working in the dairy industry.

First, I worked for a dairy consultant providing services to farmers and companies and now I work as a

field officer for the main dairy processor in Argentina (Mastellone Hermanos).

This involves working closely with dairy farmers in two dairy regions near the capital city, Buenos Aires, providing extension and technical assistance.

These experiences encouraged me to come to Australia with the aim of improving my understanding of how new technologies can be utilised to improve efficiency and profitability on dairy farms.

After arriving in February, I had the opportunity to work with many people and learn a lot about dairy science in Australia.

I worked with Dr Nicolas Lyons (NSW DPI) investigating the relationship between herd size, current adoption of precision technologies and future expectations of the industry regarding technology use.

I also assisted Dr Sabrina Lomax with the virtual herding project trying to determine individual cow responses to different cues (i.e. audio and visual).

I can definitely say that this experience has been extremely valuable for me in many aspects.

First, I had the opportunity to work with leading experts in dairy science which has allowed me to increase my knowledge and expertise in the field of pasture based dairy systems.

I learnt so much about this amazing country and its culture and visited many incredible places in Sydney including Darling Harbour, the Opera House, Manly, Bondi and the Blue Mountains.

Lastly, I met many wonderful people, made really good friends and learnt lots of Australian slang.

The challenge of living overseas, facing new situations and overcoming obstacles has helped me grow as human being.



Thanks to everyone in the Dairy Science Group for hosting me during my internship and making me feel welcome and a special thanks to Professor Yani Garcia for giving me the opportunity of working here in such a challenging environment.

I would also like to thank my company in Argentina for supporting my career development and allowing me this opportunity.

## Fernando Masia

My name is Fernando Masía, I am thirty years old and from Córdoba, Argentina.

In June 2011 I got my degree as an Agricultural Engineer at the School of Agricultural Sciences of the National University of Córdoba (UNC).

At the University, I am currently working in the Chair of Milk Production as an adjunct professor and I also hold a position as Director of the livestock production area, where I am in charge of a milking parlor and a breeding Angus cattle livestock (Cabaña Angus FCA) in the Experimental Field of the University.

At the moment, I am working in a research in relation to the impact of health and reproductive events on the dairy cow lactation curve.

I would like to participate in research teams of Dairy Science Group, especially in those related to nutrition, reproduction, biotechnology and/or animal production.

The idea of sharing knowledge from my early experience really motivates me, and it would mean an extremely useful and positive experience for my ongoing professional education.

I would also like to get to know your University campus and to have a



*Fernando Masia*

work opportunity that would allow future links between our universities.

These links could promote exchanges and scientific cooperation among professors, researchers and students from both institutions.

## Camden Farms Update

Last year we recognized him for a remarkable 50 years working for Sydney University and we recently gathered to celebrate with Kim McKean as he retired from the routine of running the University's Camden farms and dairy.

Kim has been through the good and bad of dairying over his 51 year career and has seen far more than most of us during this time.



*Recently retired Camden  
Farms Manager  
Kim McKean*



With his departure and relocation to country NSW he has left very big shoes to fill.

We are sad to see him go but glad he is now able to relax and enjoy life!

*We wish Kim good luck with his move.  
He will be missed!*

## Ollie Roberts

I've spent most of my life dairy farming in Tasmania, which is where my entrepreneurial spirit kicked into gear with the developments of

<https://Pasture.io> and

<https://Milkflow.io>.

For me, the best times are when I'm surfing or snowboarding or travelling the world (often carrying a board of some description) and most importantly spending time with my young family.

One of my goals for Camden Farms is to develop them into a high producing and self-sustaining group of properties.

My vision is to develop the dairy complex to that of a world renowned operation attaining high levels of prestige and promoting a culture of developing best practice for the industry to follow.

In the wake of Kim's departure Oliver (Ollie) Roberts has been appointed the Dairy Operations Manager and has taken on the role with enthusiasm. Read a little about Ollie below.



*Dairy Operations Manager  
Ollie Roberts*

On farm achievements to date since starting with the University of Sydney has been with an increase in animal and farm productivity in a short amount of time.

*The Dairy Science Team would like to wish Ollie all the best with his new role!*

# Recent Publications

Staff and students from the Dairy Science team have made a great start to the year with a number of publications in prominent journals.

For a look at the full listing of the groups publications please [click here.](#)

Butler, S., Thomson, P., Lomax, S., Clark, C.E.F. (2017) Optimising calf rearing and weaning by monitoring the real-time development of rumination. Precision Livestock Farming Conference 2017

Green, A.C., et.al. (2017) The vocalisations of Holstein-Friesian dairy heifers in response to social isolation and feeding. Proceedings of the Dairy Research Foundation Symposium, The University of Sydney, Camden. 22: 76

John, A.J., et.al. (2017) Manipulating the diurnal feeding behaviour of dairy cows using feed type and quantity. Proceedings of the Dairy Research Foundation Symposium, The University of Sydney, Camden. 22: 91

Khatun M, et.al. (2017) Early detection of clinical mastitis from electrical conductivity data in an automatic milking system. Animal

Production Science, <https://doi.org/10.1071/AN16707>

Lomax, S., Colusso, P., Gargulio, J., Clark, C.E.F. (2017) Determining learning and behavioural response to a virtual fence for dairy cows. Precision Livestock Farming Conference 2017

Minneé, E.M.K., Waghorn, G.C., Leea, J.M., Clark C.E.F. (2017) Including chicory or plantain in a perennial ryegrass/white clover-based diet of dairy cattle in late lactation: Feed intake, milk production and rumen digestion. Animal Feed Sci. and Tech. Vol 227, Pp 52–61

Molfino, J., Garcia, S. C., Clark, C. E. F., Kerrisk, K. L. (2017) Evaluation of an activity and rumination monitor in dairy cattle grazing two types of forages. Animal Production Science, <http://dx.doi.org/10.1071/AN16514>

Molfino, J., Kerrisk, K.L., Garcia, S.C. (2017) Investigation into the impact of a period of semi-batch milking in a pasture-based automatic voluntary milking system. Proceedings of the Dairy Research Foundation Symposium, The University of Sydney, Camden. 22: 98

Talukder, S., Kerrisk, K.L., Gianfranco, G., Celi, P. (2017) Role of oxidant-antioxidant balance in reproduction of domestic animals. Animal Production Science, <http://dx.doi.org/10.1071/AN15619>

Wildridge, A.M., et.al. (2017) Evolution of dairy cattle and farmer behaviour after transitioning from conventional to automatic milking systems. Proceedings of the Dairy Research Foundation Symposium, The University of Sydney, Camden. 22: 106

Wildridge, A.M., et.al. (2017) The impact of a shaded pre-milking yard on a pasture-based automatic milking system. Animal Production Science <http://dx.doi.org/10.1071/AN16491>



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