NSW DPI DAIRY| ROBOTIC MILKING SYSTEMS

International Precision Dairy Farming Conference Travel Report

September 2016

Executive Summary

Dr Nicolas Lyons participated in and represented NSW Department of Primary Industries at the first International Precision Dairy Farming Conference organised in Leeuwarden, The Netherlands in June 2016. The program was "on the crossroads of science and practice […] bringing together the scientists who are interested in applied precision dairy farming technology, technology manufacturers who will be the key drivers in product and service development, and veterinarians/advisors who are the key users in the latest scientific developments."

At the conference, Dr Lyons delivered two oral presentations: "*Current and future technology adoption on Australian and New Zealand dairy farms*" and "*KPI Project: Monitoring nine Australian automatic milking systems*", at the same time as he presented a poster on "*Energy audits on automatic milking systems*". These presentations were all based on the results of initiatives identified, driven and delivered by Dr Lyons.

He also participated in a pre-conference DairyCare workshop titled "*activity measurement in ruminant research and beyond*" and held a meeting with a start-up company building devices and creating algorithms (analytics) in the cloud that provide detection and prediction of dairy events related to feeding, health and reproduction. This is an excellent example of how devices and algorithms will enable the dairy industry to access the benefits of the Internet of 'Farm' Things (IoFT).

As a result of all this, the International AMS KPI Project was established. This project compares and benchmarks milk production, system utilisation and farm demographic information of pasture-based AMS farms located in Australia and Overseas. Furthermore, it has become evident there is a need to develop decision support tools that help farmers turn available data into information to inform decisions and improve profitability in what is a highly variable, constantly changing and fragile operating environment.

Participating in these conferences and meetings provides an important opportunity for NSW DPI to gain insights into the experiences in other countries and provide input into projects and developments at an early stage. It is also an excellent opportunity to showcase the results of initiatives identified, driven and delivered by the Department, which are a proof of recognition of regional, national and international expertise in this area. These types of initiatives improve the probability of successful adaptation and adoption of technologies in the NSW and Australian dairy industries.

This report contains a detailed description and analysis of the trip. Photographs and specific comments of different stages of the whole trip have been shared with the wider community using the NSW DPI Dairy's Facebook Page.

Background

Adoption of automatic milking systems and other precision dairy technologies is yielding productivity improvements and providing an opportunity to retain dairy land, animals and labour by offering a valid alternative for farmers, as well as having a positive impact on animals and system performance. As a consequence of this adoption, new jobs are being created on-farm and off-farm (service providers). In addition, the nature of jobs on dairy farms is changing in a way that is making employment more attractive to a wider range of people (especially attracting or retaining younger generations into the industry). These changes will contribute to the growth of the NSW and Australian economy.

Most of the development of these technologies occur and are more advanced in countries overseas. Participating in conferences and study tour provides a unique opportunity for the Industry to gather information that will ensure that we are best positioned to inform and advise Australian dairy farmers with regards to management and adoption of precision technology.

Precision Dairy Conference

The first International Precision Dairy Farming Conference took place in Leeuwarden, The Netherlands in June 2016. The program was “on the crossroads of science and practice […] bringing together the scientists who are interested in applied precision dairy farming technology, technology manufacturers who will be the key drivers in product and service development, and veterinarians/advisors who are the key users in the latest scientific developments.”

At the conference, Dr Lyons delivered two oral presentations: “Current and future technology adoption on Australian and New Zealand dairy farms” and “KPI Project: Monitoring nine Australian automatic milking systems”, at the same time as he presented a poster on “Energy audits on automatic milking systems”. These presentations were all based on the results of initiatives identified, driven and delivered by Dr Lyons.

The main topics covered and discussed during the conference were related to using ‘precision technology’ to manage and optimise reproduction, feeding, health, labour and welfare; as well as discuss topics related to adoption of robotic milking systems. In contrast to the previous edition that took place in 2013 in Rochester, Minnesota (United States), there was now more focus on aspects such as industry considerations or requirements for adoption of technology, economic impacts, big data, data modelling and data management.

Some of the key findings or topics discussed at the conference included:

- There is still a strong focus towards adoption of robotic milking and activity/rumination tags in different size/forms.
- It is estimated that there are more than 35,000 robots operating in 20,000 farms worldwide, milking more than 20 million cows. Robotic milking has now a range of options (full automation of milking process, as well as automation of certain tasks such as either attaching cups or spraying teats) and capacities (single and multi-box systems as well as robotic rotaries). Ireland has just commissioned a research project related to robotic milking and grazing. The Netherlands is working actively in genetic testing of cows to determine suitability for these systems (‘Robot ready’ concept).
- Use of GPS to locate animals, describe the situation of particular animals (related to things such as locomotion or welfare), as well as understand the relationship between animals but also between animals and facilities (related to queueing and usage).
- There was a lot of focus on devices to understand feeding behaviour in order to get closer to determine intake, which still remains the ‘holy grail’ in dairy systems, particularly in grazing systems.

- Camera systems appear as the next big development in the industry, with some incursions and commercial products in the area of health (lameness) and nutrition (body condition score). The use of cameras together with strong analytics, would allow a greater simplicity and lower cost, for farmers to adopt precision farming. On a large farm one camera could serve the whole herd, which brings entrance cost down in comparison to having one sensor per animal.

- Data management (flow, analytics and privacy) were a big part of the conference as well as the importance to distinguish between data and information. Most of the technologies generate huge amount of data, but little information. Information contains insights that allow farmers (or service providers) to take better decisions. It was also stressed that most of this information would be kept in the 'cloud', which brings great opportunities but also some challenges.

- Farmers are putting value in having information in right form and time, and 'apps' have a great potential to do so.

- Part of the future developments will probably concentrate in measuring parameters in milk as an indicator of health, nutrition, reproduction and welfare.

- Some discussions included the importance of user experience in technology development as this has caused or explained failure of adoption in the past.

Photographs and specific comments of different stages of the whole trip have been shared with the wider community using the NSW DPI Dairy's Facebook Page.

Overall benefits of the travel

Participation in the International Precision Dairy Conference and the associated networking opportunities improve NSW DPI's ability to support successful technology development and adoption in NSW and Australia. It also enhances NSW DPI's capacity in precision agriculture and ability to develop projects in this field.

Insights from countries that are further advanced in the adoption of precision dairy technology will be shared with the Australian industry through communication initiatives around AMS and precision technology (webinars, newsletter, online conversations, working with farmers). They will also be incorporated in projects that support the successful adaptation and adoption of technology.

NSW DPI's input into international projects and developments at an early stage enhances the opportunity for findings to be applicable to grazing systems in NSW and Australia.

Furthermore, this represented a possibility to network and collaborate with other organisations working in this domain. The presentations and posters are all part of the conferences' proceedings as a recognition of the initiatives identified, driven and delivered by the applicant.

As a result of attending these conferences and meetings, the International AMS KPI project was established. It compares and benchmarks milk production, system utilisation and farm demographic information of pasture-based AMS farms located in Australia and Overseas. This is a truly collaborative project run by the NSW Department of Primary Industries to analyse, summarise and collate information gathered from all the participating farms and provide comparison, analysis and key findings.

It has become evident there is a need to develop decision support tools that help farmers turn available data into information to inform decisions and improve profitability in what is a highly variable, constantly changing and fragile operating environment. NSW DPI is pursuing opportunities to integrate concepts proved by the AMS KPI project into initiatives around centralised data storage being developed by the dairy industry.

Conclusions

The International Precision Dairy Farming Conference provided an important opportunity for NSW DPI to gain insights into the experiences in other countries and provide input into projects and developments at an early stage. It is also an excellent opportunity to showcase the results of initiatives identified, driven and delivered by the Department, which are a proof of recognition of regional, national and international expertise in this area. These types of initiatives improve the probability of successful adaptation and adoption of technologies in the NSW and Australian dairy industries.

Appendix

Abstract of presentations delivered at the Precision Dairy Farming Conference

Current and future adoption of milking related technologies on Australian and New Zealand dairy farms

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Despite use of advanced milking technologies in Australia (AU) and New Zealand (NZ), there is limited information regarding farmers' choices. Appropriate investment in RD&E needs more information on the current state of milking related technology on farms, future intentions of farmers, and the potential knowledge gaps. Surveys were conducted in both countries to ascertain milking technology practices. The AU 2015 online survey and the NZ 2013 phone survey gathered 301 and 500 responses respectively. In AU the top 5 currently installed milking-related technologies were automatic cup removers (ACRs) (71%), herd management software / computers at the dairy (60%), automatic milk plant wash system (43%), automatic in-parlor feeding (37%) and electronic identification (35%). In the next decade farmers expected greater use of automatic heat detection systems (79%), automatic sorting gates (77%), mastitis detection tools (66%), automatic (robotic) milking systems (60%) and in-line milk meters (58%). In NZ the top 5 currently installed technologies were, electronic identification (37%), automatic in-parlor feeding (33%), ACRs (29%), automatic teat spraying (27%), and automatic sorting gates (15%). Desired technologies included: automatic sorting gates (42%), ACRs (21%), automatic teat spraying (19%), mastitis detection tools (19%) and in-line milk meters (11%). Overall, more automation technologies that saved labor were installed compared to technologies that collect data to inform decision-making on-farm (e.g. liveweight monitoring). There is an association between technology adoption and larger herd size, so continued uptake of technologies can be expected if herd sizes increase further. Greater use of data collecting devices will depend on the value perceived by farmers and the fit with their operational management. Future RD&E investment should focus on integrating data and making data interpretation easier for users with guided management recommendations.

Key words: automation, data, labor

KPI Project: Monitoring 9 Australian automatic milking systems

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Farmers considering installing AMS want to know how commercial AMS farms perform. This project will provide the industry with a better understanding of what is achievable on farms with AMS. Nine Australian AMS farms have been identified, which cover a representative range of those farms currently installed. They will be monitored on a monthly basis for a 12 month period (to June 2016). A monthly report is extracted from the system to summarize the main key performance indicators for the previous month relating to milk production, AMS utilization and farm demographics. The majority of participating farms were milking either Holstein cows or crossbreeds (Holstein and Jersey or Brown Swiss). Three farms had seasonal calving, two had split calving and the remainder year-round calving. The farms had either three, four or six single box robots, whilst one farm had a robotic rotary. All farms except two had feed stations (between two and 14 units). All the farms except one were pasture-based managing either three or four allocations per day. On average over the eight months so far, participating farms milked 199 cows (3.1 cows/ha or 52 cows/milking unit). These farms were producing 4,793 kg milk/day with a milk composition of 3.9% fat, 3.3% protein and a somatic cell count of 201,000. Individual cows were milked 2.4 times/day, producing 25.1 kg milk/day and consuming 6.5 kg concentrate/day. Average milk harvested per visit, was 10.7 kg milk and average duration was 6:20 (min:sec) in the robot. Each individual robot performed 123 milkings/day, operating for 14 hours/day and harvesting 1,334 kg milk/day. There is a wide range in farm performance, which highlights that it is the combination of farm system and farm management that determines the whole farm performance. The NSW Department of Primary Industries has committed to increase the awareness and successful adoption of automatic milking systems in Australia. This information might help farmers that are considering investing in this technology.

Key words: performance, production, utilization, demographics

Energy audits on automatic milking systems

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Problem: Assess energy use at the dairy, identify and quantify opportunities to improve efficiency, lower costs and mitigate greenhouse gas emissions. Methods: Energy audits were conducted on 12 AMS farms in Australia by analysing electricity bills and farm data as well as doing a walk-through assessment. Results: There was a range in tariff rate charges for peak and off-peak (c/KWh), and for figures on metered consumption (kWh/1000l milk). The highest proportion of electricity consumed (as % of total energy used) was assigned to milk harvesting (42.1%), followed by milk cooling (16.6%) and water heating (12.4%). Compared to conventional milking systems (CMS) the electricity consumption (expressed as kWh/1000l milk) associated with milk harvesting was almost 4 times greater, mainly due to the use of air compressors and extended run times of vacuum pumps. The electricity use for cooling milk was similar between AMS and CMS; whereas the consumption in water heating was lower for AMS, due to smaller volumes of heated water being used. Some farms retained equipment from the previous dairy that was now oversized for the needs of the AMS dairy resulting in unnecessary electricity consumption. There was potential to reduce energy demand and improve efficiency that would help lower energy bills. The main difference between AMS and CMS lies in having less cows milked at any one time, reduced volumes of milk harvested per hour, but running for more hours per day. If the equipment is not being sized accordingly, there is a real loss of energy efficiency. Although savings might be made in capital infrastructure (retaining existing equipment) this can cause higher operating costs. Implications: Farmers were provided with an individual farm energy assessment report which identified areas for improvement that could reduce energy use, lower the costs (power bills) and generate fewer greenhouse gas emissions. Farmers were also encouraged to explore the possibility of incorporating renewable energy sources.

Key words: performance, production, utilization, demographics

More information

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For updates go to www.dpi.nsw.gov.au/factsheets

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