

Moorepark News

Research, technology and innovation for the dairy industry

Issue 36

Summer 2013

Viewpoint

Weathering the Future



The recent weather-induced fodder shortage has clearly reminded us that weather patterns can have a huge impact on dairy farming, particularly in regions with heavy soils. Economic analysis indicates that Ireland's competitive advantage in milk production is based on the efficient production and utilisation of pasture. We must not lose sight of this based on two poor grass growing seasons.

The imminent abolition of quotas will provide opportunities for expansion, but also highlights the importance of providing an adequate feed base for the projected increase in dairy stock numbers. Dairy farm expansion entails risk, as the additional infrastructural investment must be financed by the existing dairy enterprise. This investment increases expenses, but initial animal performance is almost always sub-optimal, placing significant additional pressure on the original farming business.

There is nothing dairy farmers can do about the weather, but there are lessons from 2012/2013 that can help minimise the impact of such events in the future. First and foremost, the recent feed shortage has provided a clear reminder that it is necessary to build up and maintain a reserve of winter feed to mitigate against weather-induced reductions in pasture growth. Winter feed stocks were not adequate on many dairy farms when cows were housed last winter, primarily a result of poor weather and low grass growth during the previous summer.

Firstly, dairy farmers need to set a realistic target stocking rate for their particular farm; this will vary enormously depending on soil type, location and topography. Secondly, grass production will be maximised on farms where soil fertility status is high, adequate N fertilizer is applied, pastures are predominately ryegrass/white clover and soils are adequately drained. A large proportion of soils are below optimum for pH, P and K (Index 1 and 2) resulting in reduced grass production.

Therefore, it is vital that farmers place a much greater emphasis on soil fertility management. Although fertilizer N costs have increased in recent years, it still represents good value for money in well managed grassland farms. Pastures that are predominately ryegrass/white clover will significantly increase both annual and shoulder (spring/autumn) grass production.

On heavy soils, current drainage infrastructure needs to be maintained and new drainage infrastructure considered. During waterlogged conditions, poaching by livestock and machinery damage to pasture must be minimised. In the longer term, dairy farms need to grow more grass to prevent a recurrence of the feed shortage that occurred this spring and for the increased stock numbers on expanding farms.

Contact: Pat Dillon
Tel: 025 42250
Email: pat.dillon@teagasc.ie

'SMART' ingredients for export



There are opportunities for the Irish dairy sector to develop new protein based ingredients which can be used in food products assembled elsewhere in the world.

There is a growing demand for high quality powdered nutritional products, particularly in the world's emerging markets. Two factors are fuelling this demand, one is the growing world population and the other is the increasing middle class who can afford these products. This, coupled with the abolition of quotas in 2015, provides the Irish dairy sector with opportunities to develop new ingredients in dehydrated form to reach these distant markets.

Teagasc has initiated research within the food programme to study the relationship between milk protein chemistry and the reconstitution properties of dairy powders. The research will support the dairy processing sector in Ireland by building a scientific research platform around 'SMART' ingredients for export. The rationale is to provide technologies that can be used to develop dairy ingredients, which can provide a nutritional base for other foods elsewhere in the world. The key to the technology is the understanding of interactions between dairy proteins in milk during processing and manipulation of these interactions to give targeted functionality.

The research should increase competency in the area of milk protein chemistry and dehydration / rehydration science for development of dairy ingredients with 'SMART' function for targeted and concept applications while contributing to the development of the next generation of 'subject matter experts' for employment within the Irish dairy sector.

Contact: Dr. Mark Fenelon
Tel: 025 42255
Email: mark.fenelon@teagasc.ie

Animal &
Grassland Research
and Innovation
Programme

Food
Programme





Moorepark Milk Quality Tool to improve standards on farms

A new tool to improve milk quality standards has recently been developed by Teagasc. It comprises a series of video clips showing critical stages of the milking process and providing guidelines and recommendations for the production of high quality milk. This user friendly tool will provide valuable information on all aspects of quality milk production (e.g., TBC, SCC and residues).

Specific topics addressed include:

- i. milking management on smaller (12 unit parlour) and larger farms (24 unit parlour);
- ii. milking management on farms with adequate labour (2 people milking) and those with some automation (automatic cluster removers).

The tool will also be of benefit to milk quality advisors, veterinarians and milking machine manufacturers. The video series and additional information on the chemical composition of cleaning products and procedures for cleaning equipment can be accessed at www.agresearch.teagasc.ie/moorepark/milkquality/index.asp

Contact: Bernie O'Brien, David Gleeson, Tom O'Dwyer or Padraig O'Connor
Tel: 025 42274
Email: bernadette.obrien@teagasc.ie

Developing Profitable Milk Production Systems for the BMW Region



The Ballyhaise College dairy project was initiated in 2005 to investigate the profit potential of dairy production systems within the BMW region. The main issues identified as hampering profitability on dairy farms were lower growth and utilisation of grazed grass on wetter soils, farm fragmentation and poor herd fertility.

Profit monitor data indicate that average farm output in the region is 900 kg of milk solids (MS; fat plus protein) per hectare with average concentrate input of 890 kg per cow. The MS production per hectare at Ballyhaise increased from 950 kg in 2005 to 1,250 kg in 2012. This increase was achieved primarily because of improved grazing management and better herd fertility. The herd empty rate decreased (36% to 7%) while six week calving rate increased (56% to 83%) during the period from 2005 to 2012. Today, the overall herd EBI is €175. In each of the last 2 seasons, surplus dairy stock have been sold, capturing the financial benefit of a

healthier and more robust high EBI herd.

Grass production increased steadily from 12 tons DM/ha in 2008 to 15.2 tons in 2011. Poor weather during 2012 reduced grass growth to 11 tons DM per hectare, and grass growth during the first quarter of 2013 was 20% behind normal. Concentrate feed inputs increased by 36% in 2012 to 850 kg per cow. Combined with higher prices, total concentrate feed costs were €240/cow in 2012 compared with €130/cow in 2011. In addition, €140/cow was spent on winter forage during autumn 2012.

The higher profits demonstrated at Ballyhaise demonstrates the potential for long term profitable milk production in the BMW region. This model remains the only viable low risk expansion model available to Irish family farms into the future.

Contact: Donal Patton or Brendan Horan
Tel: 049 4998662
Email: donal.patton@teagasc.ie

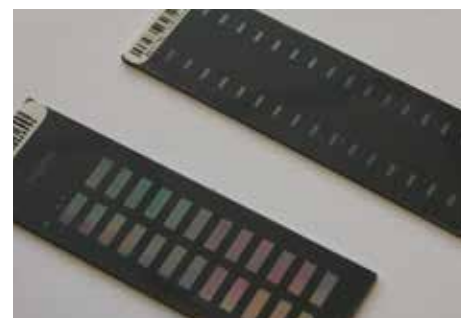
Low-cost genomic selection

Genomic selection was launched for Irish dairy cattle in spring 2009. The accuracy of identifying the best bulls for Ireland is 10-20% greater using genomic selection.

Genomic technology has been used for several decades for parentage verification.

However, this technology cannot also be used for genomic selection, resulting in duplication in costs for farmers who require both parentage verification and genomic proofs.

In 2013 Teagasc, in collaboration with ICBF, Weatherbys and the USDA developed a world-first national genotyping platform for both dairy and beef animals that will facilitate both parentage verification (and aid in solving any sire-related pedigree



discrepancies) and genomic selection. The new genotyping platform also facilitates screening of (breeding) animals for known lethal genetic defects, congenital defects and other major genes like the A1/A2 beta-casein mutation. This genotyping platform will develop further as new mutations and their effects are discovered both in Ireland and internationally.

Contact: Donagh Berry
Tel: 025-42386
Email: donagh.berry@teagasc.ie

Process Analytical Technology for dairy ingredients



Among projects with a focus on milk powder quality under way in the Teagasc Food Research Centre at Moorepark is one investigating Process Analytical Technology for better quality control in the manufacture of dairy ingredients and infant formula.

Process Analytical Technology (PAT) refers to the use of on-line or rapid techniques which can be used in manufacture to improve the control of quality and consistency of product. PAT tools are already extensively employed in the pharmaceutical sector. However, tools need to be selected according to fitness for purpose.

Developments are taking place in vibrational spectroscopy which offers significant potential in food process applications and this project will evaluate these as process analytical tools in dairy ingredient manufacture and in infant formula manufacture. The project will study important aspects of quality and safety in dairy ingredients and infant formula.

The infant formula manufacturing chain has two main parts, namely the manufacture of ingredients and the manufacture of infant formula from those ingredients. While these are separate businesses, the quality control chain has to maintain product integrity all the way through. It follows that both parts of the business would benefit from process analytical tools which would verify the integrity of the process chain.

As a result of quota abolition in 2015, the manufacture of powders as ingredients in infant formula would be a key strategic target for expansion. Competition in such markets is keen and expected to intensify, while at the same time working to pharmaceutical-type specifications. The adoption of PAT represents a key critical development in achieving this goal and this project sets out to demonstrate the potential of this approach in a number of key dairy products, using spectroscopic and microscopic techniques.

A number of specific features of powder products known to be critical from a quality perspective (e.g. surface free fat, protein denaturation) will be the subject of specific studies aimed at the development of in-process monitoring systems.

This project involves collaboration with the School of Biosystems Engineering, UCD.

Contact: Dr. Donal O'Callaghan **Tel:** 025 42205 **Email:** d.ocallaghan@teagasc.ie

Further funding for The Alimentary Pharmabiotic Centre (APC)

The APC investigates the close links between the microbiota (microbes living in the human gut), our health status, and how the food we eat programmes the microbiota. It aims to provide the necessary scientific basis for the selection of health-promoting bacteria and their bioactive metabolites for incorporation into 'functional foods' and pharmabiotics for improved health.

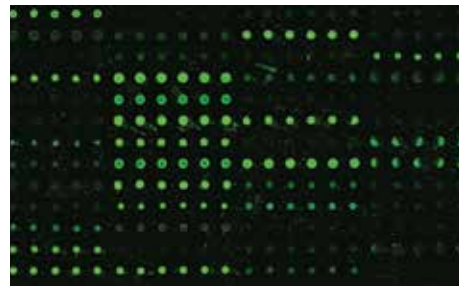
This Science Foundation Ireland funded research supports the development of novel bioactives to treat intestinal and infectious diseases and is of tangible importance to several industries, including human health maintenance, agriculture, and animal husbandry, and is pitched at the interface of the food and pharmaceutical sectors.



The APC researchers at UCC and Teagasc have been ranked #2 in the world in probiotic research (Thomson Reuters Science Watch global analysis). At the Teagasc Food Research Centre, Moorepark, Paul Ross and Catherine Stanton are APC Principal Investigators, Paul Cotter leads the Next Generation Sequencing Platform, Mary Rea leads the Culture Curation Platform.

Contact: Prof. Paul Ross
Tel: 025 42229
Email: paul.ross@teagasc.ie

Noelle wins award for her presentation on Bovine lactoferrin glycosylation at the Walsh Fellowship Seminar



Bovine milk lactoferrin (bLF) has a variety of associated biological activities and it's attached glycans are known to play an important role in its bioactive functions. To date however, little is known on how these oligosaccharide structures change over the course of lactation.

In this study, bLF was isolated from the first three months of lactation and glycosylation at each time point was profiled using lectin microarrays and monosaccharide analysis. Substantial differences between early and late lactation glycoprofiles were observed.

Lectins specific for sialic acids, terminal galactose and fucose bound most intensely to colostrum bLF, while binding to lectins which indicate the presence of high mannose type N-glycans increased as lactation progressed. The lectin binding profiles of bLF over lactation suggest that more diverse oligosaccharide structures are present in early lactation, which may correspond to the need for colostrum to provide protection to the immunologically naive mammal immediately after birth.

Noelle is doing a PhD at Moorepark and her supervisors are Dr. Rita Hickey, Moorepark and Prof. Lokesh Joshi, NUI, Galway.



From Left to Right:
Dr. Rita Hickey, Noelle O'Riordan & Prof. Lokesh Joshi.

Contact: Noelle O'Riordan
Tel: 025 42344
Email: Noelle.oriordan@teagasc.ie

Dr. Olivia McAuliffe

Dr. Olivia McAuliffe is a Senior Research Officer in the Dept. of Food Biosciences at Moorepark. Her research programme focuses on the relationship between starter cultures used in the production of fermented foods and the bacteriophage that infect them. With information generated from the genome sequences of the starters and phage themselves, her group has developed valuable capabilities in starter selection and improvement using non-GM approaches. She works closely with a number of high profile national and international companies, delivering improved cultures to the commercial starter culture and dairy industry.

Olivia is a graduate of University College Cork where she obtained her PhD in 1999. She subsequently held a post-doctoral position at the National Food Biotechnology Centre, Cork before being awarded a research fellowship to North Carolina State University in 2000 to study the genomics of food cultures. She took up her present position on returning from the USA in 2003.



Contact: Dr. Olivia McAuliffe
Tel: 025 42609
Email:
olivia.mcauliffe@teagasc.ie

Upcoming Events

Milk Quality Conference – First Announcement

Quality can give Irish milk the competitive edge on world markets, so it is critical that the highest possible milk quality standards are achieved. The production of quality milk and new tools to assist milk quality standards on-farm will be discussed at a forthcoming conference on December 4th at the Horse and Jockey Hotel, Co. Tipperary. Sessions on Chemical Residues, Somatic Cell Count and Total Bacterial Counts, together with milk processing issues will be included. The programme will include an international speaker and experts from within the Irish dairy industry.

For details contact:
Niamh.allen@teagasc.ie

New Project Director – Dr. Tom McCarthy



Teagasc and UCC have appointed Dr Tom McCarthy as Project Director for Food Innovation Alliance Ireland.

This is a strategic alliance between the two institutions to further develop the strong collaborative links that exist between Teagasc and UCC in the area of Food Science.

It also plans to further increase our interactions with industry and consolidate our position as global leaders in food science research.

Tom, an economist and former CEO of the Irish Management Institute is bringing a great deal of experience to this role and we all look forward to working with him.



Visiting scientist



Dr. Fuping Zhao from the Institute of Animal Science, Beijing, China visited Moorepark for several weeks in April and May to undertake collaborative research on computational biology with Donagh Berry.

Sabbatical for New Zealand scientist



Dr. John Roche from DairyNZ, Hamilton, New Zealand is undertaking a 6 month sabbatical at Moorepark from April to October. John undertook research at Moorepark in the early 90's to complete a Masters degree on grassland management, and is now a principal scientist at DairyNZ.

Semester at Moorepark for UCD Dairy Business students



Dairy Business degree students after completing a semester at Moorepark (January to May).

Student testimonials:

"The semester at Moorepark was very well delivered with a good balance between lectures and practical learning outside of the classroom. The aspect of the course I enjoyed most was the challenge of applying what I learned in the course to the project report on my mentor farm. The staff at Moorepark were very enthusiastic and approachable, which was fantastic."

– Morgan O'Sullivan

"I thoroughly enjoyed my experience at Moorepark. It really added to the Dairy Business Degree, and surpassed expectations. I am very thankful for the opportunity that I was given and I know it will benefit me in the future."

– Liam Hanrahan

"During the twelve weeks at Moorepark, I met and was taught by some of the top people involved in dairying in the country. As a whole I feel that this has been the best part of the Dairy business degree so far, and an experience that will surely stand to me for my future development in the dairy sector."

– Niall Brennan

2013 Gold medal for young researcher



Riona Sayers won the 2013 Young Researcher gold medal at the Department of Life Sciences (University of Limerick) research day, based on her PhD work to date on BVD and IBR viruses.

Contact us

Niamh O'Brien, Tel: 025 42313 **Email:** niamh.obrien@teagasc.ie
Teagasc, Moorepark, Fermoy, Co. Cork.

www.teagasc.ie