



Dairy Primary Growth Partnership Programme

Executive Summary

July – September 2014

In quarter 1 of FY 2015 there has been continued progress towards the outputs and impacts of the programme with continued evidence of progress both sides of the farm gate. Some examples of progress this quarter are summarized below.

Theme 1: Innovation to create on-farm opportunities

The projects in this theme develop and implement technologies, identify opportunities and improve information flow to allow dairy farmers to sustainably improve their dairy farm productivity.

An important milestone has been achieved in the work on **bovine genetic sequencing** with completion of the initial data generation phase by Livestock Improvement Corporation (LIC). This includes over 600 animals that have had their whole genome DNA sequenced including bulls (*current and historically used sires*) as well as cows from a large trial looking at important dairying characteristics such as animal health, milk production and fertility. To achieve this LIC have developed staff capability and bioinformatics systems not previously available in New Zealand, these are now being accessed by other New Zealand organisations. The programme is now moving fully into the gene discovery phase where genes (*and causative variations therein*) responsible for major production (*Breeding Worth*) traits will be identified. These in turn will be integrated into Genomic Selection improving its precision and as a result improving the rate of genetic gain available to NZ dairy farmers. To date 13 such genes have been found and some of these are already being used in the sire selection process at LIC.

Common data standards and better information systems to support farmers and others involved in the primary value chain are a feature of this and other PGP programmes. Following extensive consultation animal, stock reconciliation and financial data standards were published in August 2014 (<http://www.farmdatastandards.org.nz/>). Use of the data standards will reduce the cost and re-work of data when it is exchanged between organisations and companies.

A cross pastoral industries workshop has begun development of a new set of data standards “*Data Interchange Standards for Farm and Model Data*”. At this workshop representatives from Overseer, Farmax, DairyNZ, Red Meat Profit Partnership, FarmIQ, farm consultants and fertiliser companies identified gaps in documentation around fundamental farm-level physical information, and also the types of data input into models. This work will continue to improve the enabling and operating environment in the primary sector through data standards, data mapping and improved operability.

Theme 2: Capability and Capacity

This theme seeks to improve on-farm decisions through building industry capability, up-skilling rural professionals, developing supporting networks and attracting more people into the industry.

A **professional capability and accreditation framework** for specialist farm systems consultants has been co-developed with New Zealand Institute of Primary Industry Management (NZIPIM) and rural professionals. The framework is providing a visible development and training pathway for rural professionals. Consultancy firms have started using the framework when looking at their future capability needs and service delivery, and several firms have indicated they will adopt a ‘team delivery’ approach – developing a range

of accredited specialists (*e.g. nutrient management, people management*) in addition to the accredited farm systems consultants within the firm. Underpinning the framework is a training and accreditation system for consultants that will provide farm assessment and strategic planning support to farmers. This should be operable by the middle of next year. Banking industry representatives have indicated that this Dairy Farm Systems accreditation scheme will give them greater confidence in their referral of clients to consultants.

OneFarm and DairyNZ have collaborated in adapting the DairyNZ Farm People Management training for delivery through a blended learning system (<http://www.onefarm.ac.nz/education/courses/>). This is a highly specialist course and will assist rural professionals with gaining people management certification through NZIPIM. The courses will provide rural professionals with the knowledge, skills and processes needed to assist farmers in improving their people management on farm. It is expected that there will be eight certified specialist consultants providing people management support to farmers later next year.

Effective **farm dairy effluent (FDE) management** is critical to modern farming. Using an accredited FDE company provides assurance to farmers that their investment in effluent infrastructure will be relevant to the farm system and is capable of complying with regional council requirements when managed correctly. The number of companies with Farm Dairy Effluent Design accreditation increased to 20 in this last quarter. In addition, several new companies have expressed an interest in gaining this accreditation to remain competitive. Fonterra are endorsing the programme by providing farmers the list of local accredited companies when asked about suitable effluent system designers.

Theme 3: Creating & Managing Food Structures

The purpose of this theme is to provide an understanding of the structure of foods and how this can be managed through processing, and to generate options for new product development. Options generated by the programme are commercialised through further industry investment outside the programme.

The mid-year review of the theme was conducted on the 9th and 10th of September in Palmerston North to share progress and insights across the projects within the theme. A number of the PhD projects within the programme are likely to be completed early, reflecting on the quality of both the students and the work undertaken.

Within the new cheese making approach the **Mixing** step is emerging as the key process step that determines the structure and properties of the finished cheese. Projects investigating the links between cheese structure and functional performance on pizza have provided insights on the optimum food microstructure. However, further development of the mixing step, and the design of the mixer-cooker equipment, is required to enable many of these scientific findings to be delivered in a commercial process. The team has also identified a critical parameter that can be used to guide the scale-up design of industrial-scale continuous mixer-cooker systems (*multiple tonne per hour capacity*) based on laboratory and pilot plant experiments (*typically 1-100 kg per hour*).

Work at University of Queensland has demonstrated the potential to use a laboratory measurement technique – gap dependent rheology – to **predict sensory characteristics** of a range of foods. This will create a fast and objective measurement for important sensory features, which will support faster product development across a range of products. Whilst the technique has been developed for yoghurt, it could find application across a much broader range of dairy and non-dairy foods.

Many of the interactions that impact on the physical stability of dairy products occur on a microscopic scale, and under conditions that cannot easily be duplicated in a laboratory. Using **novel experimental apparatus** the team at the Riddet Institute have successfully achieved local temperatures of up to 200°C in a microfluidic channel without initiating boiling; this will enable us to investigate interactions between particles at UHT-like temperatures

(>140°C). At the other end of the temperature scale, initial experiments have been performed at 4°C to look at the stability of emulsion droplets¹.

Theme 4: Processing & Food Quality Management

This theme – *formerly named Transforming Manufacturing & Supply Chains* – is looking to create cost, performance, and efficiency gains in processing and food quality management and enable profitable growth in emerging dairy regions.

The *integrity of milk* entering the supply chain is critical to delivering safe, high-quality dairy products to consumers. A first generation technology for detection of commercially motivated chemical adulteration of milk (*food fraud*) has now been validated and is ready to be used in markets with large scale milk collection infrastructure. However, due to the cost of the equipment the approach is not suitable for use where large-scale collection with centralised milk testing does not occur, and complementary options are required. A survey of potential second generation technologies has identified two for development within the programme.

Work on *statistics to support food safety applications* is progressing, with a conference presentation on “*Sampling plans using composite samples for food quality assurance*”, and submission of a paper entitled “*Compressed Limit Sampling Inspection Plans for Food Safety*”. A prototype software package to assess the effectiveness and value of the new statistical approaches is also in development.

One outcome envisaged for this theme is a *unified real time quality system* to produce milk powder with optimal functional properties across the Fonterra network. This will be based on optimised modeling, process measurement and control systems. One of the challenges the team are addressing is how to convert results from a range of laboratory test methods for milk powder functionality – *many of which are based on subjective assessment against a visual performance standard* – into a numeric form that can be assessed using statistics. The ability to quantify these results – *and their associated uncertainties* – and combine them with in-process data will enable the development of predictive relationships that will provide insights about the likely functional properties of product whilst it is still being made to the operators and the process control system, enabling better process management decisions.

Theme 5: Robust Health & Wellness Benefits

This theme seeks to provide robust scientific evidence on the health and wellness benefits of dairy products for general nutrition, mobility and paediatric products. Highlights this quarter relate to mobility, and the role of healthy muscles.

Appropriate nutrition and exercise can slow the decline of skeletal muscle mass and quality, enabling people to lead active and healthy lives for longer. A second set of trials with middle aged men looking at the impact of consuming milk protein has now been completed and early indications appear to confirm earlier findings of an increase in muscle activation, and will provide additional information on the impact of serving size. The final results and supporting statistical analysis will be received in the second quarter.

A follow-up study that will look at the impact of dairy protein on functional outcomes – for example strength and stamina – over a longer period, using a temporary immobilisation approach is about to begin. This study – with a longer nutritional intervention – will help to determine the extent to which the increase in muscle activation observed following consumption translates into practical mobility benefits.

¹ See also <http://riddetfoodlink.co.nz/at/what-we-do/why-is-understanding-food-microstructure-relevant-to-food-texture-and-digestion>

New Publications and Capabilities

Publication of results has continued:

- 3 scientific papers submitted
- 8 conference presentations or posters
- 10 workshops
- 5 webinars
- 5 industry standards published.

In addition 20 confidential project reports have been completed

Investment

Total investment in the Dairy PGP programme during the first quarter of the 2015 financial year was \$5.1 M, of which industry contributed \$2.6 M and MPI \$2.5 M.