Innovation to Transform the Dairy Value Chain

Dairy Primary Growth Partnership Programme

Executive Summary

April – June 2014

In quarter 4 of FY 2014 we have seen continued progress towards the outputs and impacts of the programme with continued evidence of progress through the delivery of ***quality science*** *– including world first discoveries –* and ***strong technology transfer*** on both sides of the farm gate.

The quarter included a successful visit by the Investment Advisory Panel to DairyNZ's headquarters in Hamilton to gain a deeper understanding and insight into the two on-farm themes and the manner in which the on farm work *– with a strong focus on the sustainable growth of high-quality milk production –* and the post farm gate work *– focused on maximising the value of that milk –* fit together. In particular it was apparent that the on farm work is important in positioning Fonterra and other NZ dairy companies as trusted, reputable and responsible suppliers of dairy products.

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.

The 'Slick' gene is a gene variant discovered under Theme 1 that explains the slick coat and heat tolerance of the Senapol breed of beef cattle *(originally from West Africa)*, which is the only heat tolerant breed of Bos Taurus *(European cattle)*. The discovery of this gene enables targeted breeding of heat resistant dairy cattle using NZ dairy background genetics for deployment in tropical environments. A manuscript on the discovery of this gene has been accepted for review by the Nature journal – one of the premier international science journals. Nature publishes science that is both high quality and internationally significant. Only 5 percent of articles submitted reach this stage of the publication process.

Synlait have successfully optimised a technology for large scale on-farm production of hyperimmune colostrum to suit New Zealand conditions and has started commercial production. The product – processed via spray drying to tight specifications – is subsequently incorporated into antidiarrheal capsules. This product is currently offered for sale in several countries throughout Asia.

A Farm Data Code of Practice has been agreed and established that will enable effective exchange of data between commercial, government and industry databases, providing consistent information to farmers *(including dairy, meat and wool)* so they are able to achieve different farm management or compliance outcomes. An authority has been set up to administer the code. (http://www.farmdatacode.org.nz/?page_id=109)

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.

Recent technology transfer achievements include:

1. Over 50 percent of Fertiliser Association members are now Certified Nutrient Management Advisors (CNMA) capable of delivering Nutrient Management Plans to farmers and providing skilled advice on nutrient use to them.

Nutrients drive pasture production. However, losses from farms to waterways and lakes *– particularly nitrogen and phosphorous –* can lead to increased growth of weeds and algae, which impacts recreational, cultural and other uses.

The Nutrient Management programme has been co-developed and implemented with DairyNZ, NZIPIM, Ballance Agri-nutrients, Ravensdown and the NZ Fertiliser Association, to provide dairy farmers *(and other farmers)* with access to competent staff to assist with using nutrients efficiently under growing pressure of tighter regulations.

2. Over 570 Rural Professionals have been up-skilled in the area of effluent system design and management through a range of courses developed under or alongside the Effluent Management programme.

   Farm effluent needs to be managed to ensure it does not pollute neighbouring waterways.

   The aim of the dairy industry is to ensure all dairy farms have a fit-for-purpose effluent system and an effective effluent management plan. The Farm Dairy Effluent System Design Accreditation programme (http://www.effluentaccreditation.co.nz) and the Dairy Effluent Warrant of Fitness programme (http://www.effluentwof.co.nz) have been developed to achieve this.

3. In 2013/14 an additional 215 rural professionals were trained in the assessment of cow body condition score (BCS) to provide a highly standardised service to farmers.

   http://www.dairynz.co.nz/animal/herd-management/body-condition-scoring/trained-body-condition-scorers/

   BCS is an important consideration in a number of farm management decisions *– including feed allocation, milking strategies and drying off –* that can dramatically affect the productivity of dairy cattle. Clearly defined BCS targets have been established and, if met, can optimise both reproductive performance and milk production. By calving cows and heifers at these BCS targets, there is a lower instance of uterine infections, less mastitis and a smaller risk of metabolic disease.

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.

During the 2014 programme year two options for new mozzarella products were transferred into Fonterra's commercial product development pipeline. An important step in the development process is demonstrating that the prototype production processes are viable at a commercial scale. During the 4th quarter a commercial scale trial for one of these new mozzarella products was successfully performed at Fonterra's existing advanced mozzarella manufacturing plant in Clandeboye. The first-time success of this trial was a major milestone that has provided increased confidence in the potential of this product, which was enabled by the science and technology outputs of the programme.

An important aspect of the product development process is the transition from laboratory and pilot plant *– typically grams or kilograms –* to commercial scale *– tonnes*. An understanding of the critical parameters that govern the key process steps is required to transfer laboratory and pilot scale results into industrial process designs. Recent work has successfully identified, and validated, critical scale-up parameters for heating and mixing processes involved in the production of UHT creams and alternate-make cheese products. This increases confidence in our ability to use pilot scale results in the design of commercial processes, and reduces the cost and time required for product development.

Theme 4: Transforming Manufacturing & Supply Chains

This theme is looking to create cost, performance, and efficiency gains in processing and food quality management and enable profitable growth in emerging dairy regions.

As part of this we are developing new approaches to process control by leveraging expertise from the Industrial Information and Control Centre (I2C2), a joint research institute between the University of Auckland and the Auckland University of Technology. The focus is on the use of data driven techniques to improve milk processing efficiency, and the potential of the approach has been demonstrated through prototype software tools applied in a realtime process setting earlier in the year. A new two year contract has been established that will focus on milk powder process control and quality.

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.

A review paper that sets out what is known about changes in muscle quality that precede loss of muscle mass and functionality has been published. This paper will help identify gaps and opportunities for new science in the mobility area and provides useful information for future work with a muscle quality focus – including the preparation of dossiers to support nutritional intervention. Muscle quality is a much more appealing story for many consumers than muscle mass and strength.

Preliminary results from a study of body composition measurement technologies – to enable rapid and non-invasive assessment of muscle condition – are promising. Non-invasive methods to help consumers understand their current body condition can form an important part of marketing functional food products. This has previously been demonstrated by the successful bone-scan partnership between Fonterra and GE in support of ANLENE™.

New Publications and Capabilities

Publication of results has continued:

- 5 scientific papers published,
- 9 published guidelines or codes
- 2 industry articles,
- 8 scientific papers submitted,
- 18 conference presentations.

1 new PhD student and a new postdoctoral fellow have commenced.

Investment

Total investment in the Dairy PGP programme during the fourth quarter of the 2014 financial year was $7.8 M, of which industry contributed $3.8 M and MPI $4 M.