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Transforming the Dairy Value Chain Primary Growth Partnership Programme

Progress Review – Final Report

An independent assessment of how this Primary Growth Partnership (PGP) Programme is tracking towards the achievement of its contracted outcomes.

27 July 2015

Final Report. This report has been prepared for MPI on the terms set out in the Introduction and the limitations set out in on Page 32. We accept no duty of care or liability to you or any third party for any loss suffered in connection with the use of this report.

Our overriding objective was to provide an independent assessment of how the Programme is tracking towards its contracted outcomes or benefits.

Introduction

- The table on Page 10 and the following commentary summarises our overall assessment of the Transforming the Dairy Value Chain Primary Growth Partnership (the Programme) against the objectives that were set out in the Terms of Reference (TOR) for this Progress Review. This should be read together with the Summary of Findings (SoF) on Pages 12 to 26 which provide further detailed commentary related to our observations and recommendations.
- Our assessment covers each Theme and uses a simple traffic light approach across the following areas:
  - Progress to date. Or an assessment of what has been actually achieved in terms of outputs against plan.
  - Likelihood of achieving contracted outcomes. Or an assessment of the likelihood of realising the intended benefits.
  - Impact of any significant risks and an assessment of how these are managed and mitigated.
- The traffic light interpretations are subjectively applied based on a range of observations and evidence. These simple assessments can be interpreted as follows: (i) Green means tracking in line with or above expectation and there is a high level of confidence that the intended outcomes will be achieved; (ii) Orange means tracking in line with or above expectation, where although there is a reasonable level of confidence, there is also a degree of uncertainty as to whether intended outcomes will be achieved; and (iii) Red means tracking below expectation and there is a significant risk that intended outcomes will not be achieved. We then bring the above together to provide an overall assessment. The challenge of this approach is that a wide range of disparate activities with different challenges, issues and opportunities have been invested across the Programme, and also within individual Themes. Therefore the assessment ratings incorporate a great deal of averaging and subjectivity.
- As a result we put more emphasis and focus on the supporting commentary and in particular the SoF, which sets out in some detail what we believe are the key issues at a portfolio level and need to be addressed to maximise the opportunity for successfully achieving the intended outcomes. For clarity, unless otherwise explicitly stated, when we refer to the Programme we are referring specifically to the Transforming the Dairy Value Chain Primary Growth Partnership. PGP is used to refer to the Ministry for Primary Industries (MPI) portfolio of Primary Growth Partnerships. PSG is used to refer to the Programme Steering Group for the Transforming the Dairy Value Chain PGP Programme.

Individual Theme Assessments

Theme 1

- Overall this Theme is progressing to plan and is well-placed to deliver significant outcomes. The Theme is dominated by the Gene Sequencing project (50%) and planning for the conclusion of Programme funding is well advanced.
- For the smaller Pre-Farm Gate projects, however, the more challenging and, by definition, the more risky aspects of delivering the Theme's benefits are to come (e.g. farmer support). 29% of the budget is available to deliver the Objectives and transition into business as usual (BAU), with the majority of it to be spent in the years ending June 2016 and 2017.
- The appointment of the PGP Programme Manager to support and lead the Themes through the coming transition into the BAU environment will increase the likelihood of realising the anticipated benefits.

Theme 2

- Theme 2's Objectives are delivered through a collection of 12 capability and development projects that are primarily managed independently of each other. Progress to date is largely meeting plan, however more challenging and, by definition, the more risky aspects of delivering the Theme's benefits are to come.

As the Programme approaches its completion date, quarterly reporting will need to evolve to support increased PSG focus on ensuring outputs are transitioning into outcomes.

- 31% of the budget is available to deliver the Objectives and transition into the BAU environment, with the majority of it to be spent in the years ending June 2016 and 2017. Sufficient resources are available in the budgets to deliver on expectations.
- The BAU environment beyond Programme funding is closing fast and a comprehensive and cross-disciplined strategy and transition plan (part of the annual plan) is required to continue the drive of awareness, cultural change and the value proposition needed to embed and sustain the certification and accreditation process into the advisory landscape of the dairy industry. We understand that this planning is now underway.
- Proposed evaluation indicators for the projects should be revisited to consider the 'direct influence' of the projects outputs and activities on decision making and practice changes on-farm. We would expect to see these coming through in the 2015/16 Annual Plan.

Theme 3

- Theme 3 is well managed against strategic priorities. The standing expert panel is of high international standing and delivers a robust report and strongly endorses the quality work that has been done in this Theme.
- There are technical challenges related to the inherent difficulty of the work, but the outputs and achievements continue in line with plan. There is good evidence of outputs entering into the New Product Development (NPD) processes and we understand the business is starting to move options transferred into New Product Development into commercial environments.
- There is a high level of confidence that technical challenges will be navigated and successful outcomes will be achieved. The pathways to the opportunities are intuitively clear, but limited detail in this regard was provided due to commercial sensitivity.

Theme 4

- There is high engagement with the business and importantly with Fonterra's Advanced Process Control Group. Fonterra's Food Safety and Quality team also has proximity to the work undertaken in this Theme. External Expert Panels are also engaged to provide input into the quality of the research undertaken.
- Both Objectives 3.2.3 Quality Compliance and 3.2.5 Quality Assurance are progressing in line with plans. Notwithstanding, there is an element of technical risk. Management is confident that further planned technical milestones will also be met.
- There appears to be very strong demand pull signals from the business in relation to the technologies being developed by this Theme, particularly relating to supporting Fonterra's strategy to grow its milk supply and build world class quality and food safety processes. The pathways to achieving contracted outcomes are very clear.

Theme 5

- There is a good alignment with strategy and this Theme appears to be well managed. There is use of a range of Expert Panels.
- Objectives 3.3.3 Mobility and Ageing and 3.3.4 Paediatrics are progressing in line with plans. Management remains confident that clinical trials will be successful but recognise these investments clearly involve elements of uncertainty and risk.
- The commercial pathway for both Objectives are clear. This research will enable Fonterra to better position its Anlene and Annum brands and develop complementary marketing stories. If successful, there may be material potential economic benefits.

On balance we believe there is a strong likelihood of the Programme achieving significant economic impacts and important industry change. But there are challenges…

Overall Conclusions

- As highlighted above we recommend the reader puts greater emphasis and focus on key issues raised at the portfolio level as opposed to individual Theme assessments.
- On balance we believe there is a strong likelihood of the Programme achieving significant economic impacts and important industry change. However, there are a range of challenges and areas that we believe need to be addressed in order to maximise the opportunity for successfully achieving the intended outcomes.
- At the outset of the Progress Review we posed a range of questions divided into two broad categories: (i) Benefits and (ii) Governance and Execution. In reporting our findings, we have followed the same structure.

Part A: Benefits

Benefits Framework

- Targeted annual economic benefits are $2.7 billion by 2020, together with reduced environmental impacts by 2020.
- However, benefit targets are poorly defined and have not been broken down or attributed to key investment tranches. There is no established benefits realisation framework in place to measure progress to outcomes, although an outcome logic framework with draft indications and measures against which progress is measured has been developed. These need additional refining.
- A benefits realisation framework needs to firstly establish the processes for managing the transition from outputs to outcomes. Further, it is required to robustly measure and evidence the benefits. In this regard, the Progress Review (or the Report) provides various related recommendations and incorporates some upfront considerations for the design, development and implementation of a benefits realisation framework.
- Wider communications are needed to explain the rationale for the Programme and the successes (or otherwise) of investment in this Programme, which need to be evidence-based.

Programme Linkages

- Although there are management and governance challenges associated with administering a large and complex Programme, we believe there are good strategic reasons for structuring the Programme across the value chain.
- Essentially an efficient, consistent and sustainable integrated value chain is the New Zealand dairy industry's most significant competitive advantage. In particular, Fonterra and other processor / marketers need to be able to confidently engage with customers around issues of quality and sustainability of supply.
- The linkages and benefits between the Pre- and Post-Farm Gate sides of the Programme need to be strengthened and better communicated, recognising that, due to the nature of the work, linkages primarily relate to linked outcomes rather than direct links between projects.

Progress and Achievements

- Over time, Programme outputs or project achievements appear to have gathered momentum. The projects are generally well managed and are meeting specified contracted outputs and technical milestones.
- At this point in the Programme the key risks for achieving expected outcomes are not related to producing Programme outputs per se, but are primarily related to: (i) ensuring there is a market need or relevance of the Programme and (ii) having the necessary delivery capability for transferring technologies and outputs.
- Sensitivity to these risks is somewhat dependent upon whether projects are Demand Pull or Industry Push projects. The Post-Farm Gate Programme is heavily weighted (if not entirely) to Demand Pull projects. There are a range of Demand Pull projects within Theme 1, including Gene Sequencing and Designer Milks workstreams.

Over time the Programme output appears to have gathered momentum. The projects are generally well managed and are meeting specified contracted outputs and technical milestones.

Demand Pull

- Demand Pull projects are still subject to 'relevance risk issues'. But inherently the commercial imperatives are such that Partner organisations are incentivised to react to market signals to either (i) take advantage of the opportunity presented or (ii) turn off the investment because it is unlikely to produce any economic advantage.
- We recognise that from time to time commercial organisations will change strategic priorities and focus, and this can have implications for the prospects of a Programme investment. Changes in strategic focus are about the reality of realigning to changes in the macro environment.
- Arguably there were some examples whereby the market signals and commercial insight that Fonterra provided to its Programme investment was slow and resulted in the investment continuing for longer than it should have. However, we do not believe there is any systematic issue in this regard. Fonterra maintains robust internal gating processes and its Programme Theme leaders are effectively engaging with the wider business. Importantly, Fonterra's current suite of Programme projects all appear to be closely aligned with Fonterra's strategy.

Industry Push

- On the Pre-Farm Gate side of the Programme, DairyNZ (DNZ) is delivering a number of Industry Push projects. Programme funding has strengthened cross-industry collaboration in this area. Maintaining New Zealand's industry competitiveness and position in the market place requires farming practices to evolve and for capabilities to be built ahead of the curve.
- Although Industry Push projects have less technical challenges in relation to the development of the underlying outputs or the delivered technologies and / or capabilities, these types of projects have greater risk exposure in terms of ensuring there is a genuine market need and the technology and output is taken up by farmers.
- Speed and quantity of uptake by farmers, rural professionals (RPs) and service providers to farmers is a key indicator of success for these projects. The joint delivery mechanisms, promotion and marketing of these new products and services are in the process of being considered. This is a key focus for the Programme moving forwards to ensure the uptake targets are met.
- A comprehensive and cross-discipline plan is needed to continue to drive the awareness, cultural change and value proposition needed to embed and sustain the certification and accreditation processes into the advisory landscape.
- If the value propositions for these new products and services are not well defined, priced and communicated to target audiences, then the planned uptake targets will not be met. Correspondingly if the these targets are not met the benefits to the sector will not be achieved. We recommend that the annual planning process is utilised to specifically allocate resources to addressing the issues raised.

Spillover

- The original business case identified significant spillover benefits to the wider NZ economy. We believe that generally momentum around spillover activities is beginning to flow as the maturity of the Programme grows.
- We have been provided examples of where spillover benefits have already eventuated, such as students engaging with visiting experts, published papers, academic and employment opportunities, collaboration with Beef + Lamb, and with Livestock Improvement Corporation (LIC).
- These need to be better managed, quantified and communicated to external stakeholders and should be incorporated into a benefits realisation framework.

The recent appointment of a Programme Manager was overdue. But the Partners need to give further consideration as to what support is required to ensure this role has real influence.

Part B: Governance and Execution

Programme Management Office

- The recent appointment of an overall Programme Manager was overdue. As it stands, it will be challenging for the Programme Manager to interface and influence a disparate group of projects that are embedded within DNZ and other sub-contracted third parties.
- However, we believe the Programme Manager will play a critical role in delivering benefits. To be truly successful the Programme Manager should effectively become the chief executive of a Programme Management Office (PMO) with direct reach into all areas of the Programme.
- We observe there are differing approaches to managing Programme investment. Fonterra operates an approach whereby Theme leaders are responsible to the Fonterra Programme Manager. DNZ programmes are matrix orientated and sit alongside other complementary farmer facing policy programmes. Leadership and investment by the Strategy and Investment Leaders (SIL) is therefore broader than just this PGP. Theme 1 objectives 2.1 and 2.3 are subcontracted to Synlait and LIC and consequently are not overseen by the DNZ SILs.
- However, in our view it makes reasonable sense for DNZ to internally appoint Programme Theme investment managers, who will support the Programme Manager, and responsible for managing Programme investment and delivery within Themes 1 and 2. We anticipate the critical focus for these roles will be ensuring there are processes and mechanisms in place to transfer the resulting project outputs, or technology and capability, into outcomes, as needs to be demonstrated in line with PGP philosophy. Also importantly, these roles will greatly assist the Programme Manager's reach into DNZ and will promote a more holistic approach across the Programme.
- Implementing a more formal PMO will underpin the successful delivery of the Programme. It will improve operational efficiencies, enabling standardised processes and reporting. It will encourage more proactive and coordinated management of benefits realisation and provide coaching for project managers.

Reporting Processes

- After a prolonged settling down period, the Programme has now established effective governance oversight processes. While our overall view is that the Programme is generally well managed, we believe there are a range of opportunities to better standardise processes across the Programme.
- From an independent review perspective, while the quarterly reports are comprehensive and represent significant improvements from previous reporting, they do not appear to readily support or direct the PSG to focus on the relevant strategic issues and priorities.
- We anticipate that as the Programme approaches its completion date, quarterly reporting will need to evolve to support greater PSG focus on ensuring outputs are transitioning into outcomes. Across the Programme there is a range of opportunities for greater consistency and coordination of processes.
- As highlighted above we believe that a more formal PMO will provide greater emphasis on identifying opportunities to better standardise processes and reporting. Some specific opportunities are noted as follows:
  - With regards to expert review panels, using standardised reporting templates together with maintaining a centralised log of recommendations and actions (and rebuttals).
  - Using more consistent language and definitions to describe Programme activity. For example, Pre-Farm Gate and Post- Farm Gate have different meanings for Objectives and Milestones.

The annual planning process should be enhanced to prepare the Programme beyond the conclusion of Programme funding in 2018.

- Greater consistency in the presentation of financial reporting and analysis. For example Pre-Farm Gate and Post-Farm Gate have different approaches to reporting administration and also developing (yet to be scoped) projects.
- Maintaining centralised registers of information relevant to the important outputs and achievements of the Programme, such as participation of graduate and post-doctoral fellows including successful completion of study or finding permanent employment.

PSG Composition

- The members of the PSG we spoke to all confirmed that they believe the PSG is functioning well and there is a good balance of experience and expertise around the PSG table. We agree with this self-assessment.
- But we also believe at this point in the Programme, and with a senior MPI PSG representative taking extended parental leave, it is timely for the PSG to consider its composition and the skills needed to deliver the benefits as the Programme approaches its completion date.

Approaching Completion

- The Programme has around three years to run. At the end of FY15, Themes 1 and 2 will have spent around 70% of their respective available funding, implying that these workstreams are very much approaching their delivery phases.
- Accordingly, annual planning processes should be increasingly focusing on incorporating activities to prepare the Programme to enter a BAU environment and funding evaluation indicators. Transitioning project deliverables into a BAU or post-PGP environment is significantly more challenging where the project activity and the benefit(s) do not sit with the same organisations. We anticipate that from here on a significant amount of planning and coordination is required to maximise the likelihood of achieving the intended outcomes of this Programme.

Assessment ratings incorporate a great deal of averaging and subjectivity, but hopefully a useful snapshot. More emphasis and focus should be on the supporting commentary and SoF.

	Theme 1	Theme 2	Theme 3	Theme 4	Theme 5	Programme
Progress to Date						
Likelihood						
Key Risks						
Conclusion						

On balance we believe there is a strong likelihood of the Programme achieving significant economic impacts and important industry change. But there are challenges…

Key finding	Observation	Implication and Recommendation
Benefit targets are poorly defined and have not been broken down or attributed to key investment tranches. **There is no established benefits realisation framework in place to measure progress to outcomes.** **A benefits realisation framework needs to firstly establish the processes for managing the transition from outputs to outcomes. Further, it is required to robustly measure and evidence the benefits. Wider communications are needed to explain the rationale for the Programme and the successes (or otherwise) of Programme investment and these also need to be evidence-based.**	• Benefits are the overall indicators of success of the Programme and are specified within the contract in terms of economic targets and other strategic goals. • Specifically, targeted annual economic benefits are $2.7 billion by 2020, together with reduced environmental impacts. However, there is some confusion in relation to the 2020 timeframe as MPI's public website states that this target will not be achieved until 2025. • Targeted benefits are poorly defined and have not been broken down or attributed to key investment tranches. We reviewed both the original business case (July 2010) and supporting analysis prepared by Boston Consulting Group (November 2010). On balance, we believe these targets appear to be largely 'aspirational' and have limited quantified / modelling support. • There is no established benefits realisation framework in place to measure progress to outcomes. However, there is an outcome logic framework with a large number of draft indications and measures against which progress is measured. These need additional refining. • Notwithstanding the above issues, we believe that on balance Programme activity has good momentum. Projects are generally well managed and are achieving specified outputs, which are creating exciting, high potential opportunities, as demonstrated by case studies presented for each Theme within this Report.	• Our overriding objective was to provide an independent assessment of how the Programme is tracking towards its contracted outcomes or benefits. Clearly our ability to provide a proper assessment of how the Programme is tracking towards its contracted outcomes or benefits has been limited by the lack of a benefits realisation framework. • However, we have been provided with some anecdotal examples of innovations and capabilities already developed (achieved). Related projects are progressing well against corresponding contractual milestones / objectives and have the potential to deliver significant economic impacts and important industry change. • On balance we believe that there is a strong likelihood of the Programme achieving significant economic impacts and important industry change. But in the absence of supporting analysis and evidence (which is not available and to prepare from source data is beyond our scope) it would be premature to put an economic quantum or a timeframe on the achievement of potential benefits. • Development of a benefits realisation framework will firstly assist with the establishment of processes for managing to outcomes, and secondly provide evidence of how the Programme is tracking towards the achievement against targets. • Communication to the respective shareholders, levy payers and also the general public is expected, along with the need to explain the rationale for the Programme and the successes (or otherwise) of Programme investment. This needs to be evidence-based.

Implementation of a benefits realisation framework to measure progress and achievement against targeted outcomes is the single biggest issue facing the Programme.

Key finding	Observation	Implication and Recommendation
At this point in the Programme, the need to develop a benefits realisation and tracking framework is an urgent issue. **It is not an insignificant project. First and foremost it is about building processes to manage the transition of output to outcome.** **Benefits will need to be measured consistently across the Programme and take account of a range of upfront framework design considerations. MPI has also recognised this need and is in the process of developing an overarching benefits framework as recommended in Appendix A of the NZIER report dated May 2014.**	• We anticipate a benefits framework will need to take account of the following design considerations: – Ensuring only the incremental gains and / or improvements are captured and not substitution effects. – Avoiding obvious 'double counts' or Pre-Farm Gate and Post- Farm Gate benefit duplications. – Normalisation for historical run-rate productive improvements. – Establishment of an appropriate baseline against which to measure benefits. – Including adjustments or normalisations for market and / or external related factors, including payout volatility and climatic effects. – Other considerations in relation to economic measurement and presentation, including real / nominal inflation and financial time value of money considerations. – Capturing strategic benefits, such as sustainability and welfare issues, which may not easily and directly translate into accounting / economic measures. – Recognition of spillover and other indirect benefits, both with other PGP programmes and wider economic spillover. – Need to be aware of and manage implications for commercial sensitivities and financial market regulations. – Ensuring processes enable benefits to continue to be tracked and measured post-Programme.	• We recommend that as a matter of urgency the Programme commits to a project to develop a benefits realisation and tracking framework. This should be a core capability of the PMO (discussed later). • MPI is also progressing the development of a benefits framework for the wider PGP portfolio and we recommend that the benefits framework developed for this Programme is closely aligned to this process. • We believe this Programme presents an opportunity for MPI and the Partners to closely collaborate. We recommend that the Programme and MPI arrange a workshop to explore opportunities in this area.

We believe there are good strategic reasons for structuring this Programme across the wider value chain. More work is required to identify linkages and realise synergies.

Key finding	Observation	Implication and Recommendation
On the face of it there may appear to be limited utility in structuring such a large Programme with a seemingly disparate set of project activities. **However, we concur with the views of the Programme, and others we spoke to, that there is a sound rationale for structuring this Programme as a joined-up programme.** **But more work is required to ensure greater linkages between the Programme project activities. This emphasis should be incorporated into the development of the benefits framework and be better communicated to external stakeholders.**	• The Programme is large and complex. It covers a wide range of distinct Themes and Objectives from different parts of the value chain. Project activity is also being undertaken over a long time period, or seven years from establishment in 2011 to completion in 2018. • As a result, there are limited obvious or direct interdependencies between many of the various Themes and Objectives. Further, the scale and breadth of the Programme, covering the end-to-end value chain, has probably resulted in greater administrative challenges than would have otherwise been encountered under a more compartmentalised approach. • However, at its core we believe there are good strategic reasons for structuring this Programme across the wider value chain. The Fonterra and DNZ senior executives that we independently interviewed relayed this view. • Essentially, an efficient, consistent and sustainable integrated value chain is the New Zealand dairy industry's most significant competitive advantage. In particular, the processing and marketing end of the value chain needs be able to confidently engage with its customers around issues of quality and sustainability of supply. • Synlait has provided an excellent, albeit niche, example of this working in practice. There was little other evidence of the linkages occurring across the Pre- and Post-Farm Gate sides of the Programme.	• Both the Pre- and Post-Farm Gate sides of the Programme appreciate the value of the opportunity that comes from being able to better go to market with an integrated value chain customer proposition. There is mutual goodwill and high levels of enthusiasm in this regard. • But more work is required to identify and establish greater linkages and synergies across the various project activities within the Programme, particularly focusing on integrating activity from the Pre- and Post-Farm Gate sides of the Programme. • This recommendation should be incorporated into the development of a benefits realisation framework. It is also complemented by a range of other supporting recommendations within this Report. • The benefits of this integrated value chain approach should also be part of a communications strategy.

Over time the Programme output appears to have gathered momentum. The projects are generally well managed and are meeting specified contracted outputs and technical milestones.

Key finding	Observation	Implication and Recommendation
At a portfolio level Programme activity has good momentum and we believe is producing outputs at a rate, quality and scale that gives reasonable confidence in the ability to achieve expected outcomes. **At this point in the Programme the key risks for achieving expected outcomes are not related to producing Programme output per se, but are primarily related to: (i) ensuring the goals are relevant and (ii) having the necessary delivery capability for transferring technologies and outputs.**	• Over time the Programme output appears to have gathered momentum. The projects are generally well managed and are meeting specified contracted outputs and technical milestones. • More detail of the Programme achievements are covered within the individual Theme Assessment sections, but the following summarises some illustrative examples of areas where the Programme is delivering output and achievements: – Discovery of a number of gene variations linked to dairy cow productive traits. – Optimised spray drying technologies which will enable a range of potential new products. – Established data standards / codes that will enable more effective information sharing between industry databases. – Developed a range of programmes designed to build better capability and upskilling. – Developed technologies that will enable the efficient manufacture of improved customised Mozzarella products. – Undertaken various nutrition studies that scientifically support health benefits associated with a range of Fonterra branded products. – Development of accreditation processes to improve quality and consistency of advice to farmers. – A number of best practice guidelines / practice notes, for example the Farm Dairy Effluent Design Code of Practice and the Code of Practice for Nutrient Management.	• At this point in the Programme, we believe that key risks to achieving expected outcomes / benefits are not related to producing output per se, but are primarily related to: i. Ensuring the continued relevance of the Programme output or goals in relation to a demand or need. ii. Having the necessary capability to ensure delivery and uptake of resulting technologies and output. • To this end, further discussion is provided overleaf in SoF 5 and 6 in relation to how the Programme is managing these risks.

Demand Pull projects are subject to relevance risk. But commercial imperatives are such that organisations are incentivised to evaluate Programme outputs in the context of market opportunity.

Key finding	Observation	Implication and Recommendation
Programme projects effectively fall within two broad categories: Demand Pull projects and Industry Push projects. **On balance there are strong commercial incentives for the Partners involved in Demand Pull projects to capture economic benefits available from Programme innovation and outputs.** **When Partner organisations change strategic priorities, it may result in rescoping or turning off Programme investment.** **There are examples of this occurring. We believe this is completely rational and is the result of the Partner evaluating the Programme opportunity in the context of the market.**	• The Programme projects effectively fall within two broad categories: Demand Pull projects and Industry Push projects. The Post-Farm Gate Programme is heavily weighted (if not entirely) to Demand Pull projects. There are also a range of Demand Pull projects within Theme 1, including Gene Sequencing and Designer Milks. • Demand Pull projects are still subject to 'relevance risk issues'. But inherently the commercial imperatives are such that Partner organisations are incentivised to react to market signals to either (i) take advantage of the opportunity presented or (ii) turn off the investment because it is unlikely to produce any economic advantage. • We recognise that commercial organisations such as Fonterra from time to time will change strategic priorities and focus, and this can have implications for Programme investment. However, changes in strategic focus are about the reality of realigning to perceived changes in the macro environment. • Some examples of projects that were rescoped or turned off following market changes include: – Lactose or Objective 3.1.4 (Terminated). – Natural Cheese Slice projects related to Objective 3.1.2 (Terminated). – Anmum and Anlene related to Objectives 3.3.3 and 3.3.4 (Rescoped). – Process Design or Objective 3.2.2 (Terminated).	• At the end of the day, relevance risk issues are an unavoidable commercial reality. The advantage of Demand Pull projects, and also where the potential benefits is owned by the Partner, is that there are strong commercial incentives to align Programme investment with the market opportunity. • Partner organisations are incentivised to react to market signals to either take advantage of the opportunity presented or turn off (or rescope) the investment because it is unlikely to produce any economic advantage. If it is the latter, that is a good thing; it is just a rational reaction to market signals.

There are a number of 'Industry Push' projects within the Programme which are necessary for the NZ dairy industry to remain sustainable and competitive.

Key finding	Observation	Implication and Recommendation
Industry Push projects are in response to regulatory and market demands. If these strategic matters are not resolved, access to a growing source of consistently high quality milk solids could be at risk. **Farmers and their service providers have not responded to these regulatory and market needs and therefore the interventions through a programme are warranted.** **However, the continuity and sustainability of these programmes after the conclusion of Programme funding is not clear.** **The benefits case is premised on the high uptake of these programmes.**	• On the Pre-Farm Gate side of the Programme, DNZ is delivering a number of 'Industry Push' projects. The Programme funding has strengthened cross-industry collaboration in this area. Maintaining New Zealand's industry competitiveness and position in the global market place requires farming practices to evolve and capabilities to be built ahead of the curve. • DNZ has incorporated the projects within the Programme into its own management structures. These projects have been managed independently of each other as they build the infrastructure, tools, capability and methodologies to solve the issues they are addressing. The Project Leads are beginning to consider how they transition into a BAU environment post Programme funding and also how they coordinate and collaborate with other Pre-Farm Gate projects. • In some cases the entities delivering these projects may not be the commercial and / or industry bodies that will ultimately "own" and deliver the resultant products and services (e.g. certification and accreditation process) beyond the conclusion of Programme funding. The joint delivery mechanisms, promotion and marketing of these new products and services are part of the project plans and are in progress. This is a key focus for the Programme moving forwards. • Examples of where Pre-Farm Gate projects have been successfully transferred out of the Programme and into BAU include PICA, Pasture Growth Forecaster, and several accreditation / certification programmes, such as the Certified Nutrient Management Advisors and Farm Dairy Effluent System.	• Speed and quantity of uptake by farmers, RPs and service providers to farmers is a key indicator of success for these projects. The joint delivery mechanisms, promotion and marketing of these new products and services are in the process of being considered. This is a key focus for the Programme moving forwards to ensure the uptake targets are met. • The development of the underlying Programme outputs or the delivered technologies and / or capabilities is often subject to lower levels of technical challenges and risk. However, Industry Push projects inherently have a greater level of risk in relation to capturing the overall benefits of the Programme output. This risk is related to both ensuring relevance of goals and the effective delivery / transfer of the technologies and outputs. • A comprehensive and cross-discipline plan is needed to continue to drive the awareness, cultural change and value proposition needed to embed and sustain the certification and accreditation processes into the advisory landscape – directed towards: RPs, companies, local government and industry organisations; and dairy farmers. • If the value propositions for new products and services are not defined, priced and communicated to the target audiences, then the planned uptake targets will not be met. Consequently, the outputs from the Programme will not be enduring or sustainable, and ultimately intended benefits will not be realised. • We recommend that the annual planning process is used to allocate resources to addressing the issues raised.

We believe that 'beyond business as usual' is a useful indicator but should not be a pre-requisite for eligibility.

Key finding	Observation	Implication and Recommendation
We believe that 'beyond business as usual' is a useful indicator but should not be a pre-requisite for eligibility. **Rather, the fundamental philosophy of PGP is that projects are scoped in response to a specific industry challenge or opportunity whereby PGP intervention aims to achieve greater benefits, and / or within shorter timeframes, than would have otherwise been possible.** **We identified a range of Programme activity that was arguably 'not beyond business as usual' but was very clearly consistent with the fundamental philosophy of PGP.**	• One of the specific questions in our Terms of Reference was to consider whether Programme activities were 'beyond business as usual' for the Partners. • We appreciate large organisations, such as Fonterra and DNZ, undertake a portfolio of research and development projects. There will be budgetary constraints and a range of tactical and strategic factors influencing which projects are prioritised over others. • In the absence of PGP funding, a PGP related project may still be undertaken, thereby implying the project was 'business as usual' or rather the investment would have been done anyway. However, it needs to be recognised that another equally valid candidate would be lower priority and not be funded. • Further, we also saw a range of areas that were clearly being invested in more heavily than would have otherwise been the case. That is not to say without PGP there would not have been an investment into a particular area or need, but rather it would have been less, which naturally has consequences on outcomes or benefits.	• On balance we believe that the 'beyond business as usual' criteria should not be overemphasised when determining eligibility. Rather, the key focus for eligibility should be on the fundamental philosophy of PGP, or providing intervention to deliver greater benefits and / or with in shorter timeframes than would have otherwise been the case. • We discussed the interpretation of 'beyond business as usual' at a scoping meeting with the PSG in December 2014. The general consensus arising from that discussion was consistent with the above. • While MPI's Co-Investor Guidelines describes the additionality criteria in more detail, we believe that MPI should better communicate its interpretation of 'beyond business as usual' for programme activities throughout the life of the programme.

The business case identified significant spillover benefits to the wider NZ economy. These need to be better managed, quantified and communicated to external stakeholders.

Key finding	Observation	Implication and Recommendation
Spillover benefits are occurring across a range of projects. **Spillover activities and their benefits are not being tracked centrally and therefore are not currently available to be considered as part of the wider benefits realisation process.** **Spillover benefits should be better communicated to stakeholders as part of the storytelling.**	• The original business plan identified a range of possible spillover opportunities for the wider agri-sector as a result of investment in the dairy value chain. It was an evaluation criteria for PGP funding. These include increased capability in the NZ food research and technology sectors and also commercial opportunities for RPs and service providers, to name a few. The business case did not quantify the value or timing of these spillover benefits. • The momentum around spillover activities is beginning to flow as the maturity of the Programme grows. We have been provided examples of spillover benefits that have already eventuated e.g. students engaging with visiting experts, published papers, academic and employment opportunities, collaboration with Beef + Lamb and with LIC, and outputs relevant to other sectors (e.g. farm data standards are relevant to the red meat sector). • The identification of spillover benefits in the annual planning process is not consistently applied across the Programme.	• Spillover activities and benefits should be identified as part of the annual planning process. • The achievement of the spillover opportunities should be actively managed and once achieved reported to the PMO. • The benefits achieved should be incorporated into the overall benefits monitoring process. • Communication of spillover benefits should be part of the Programme's wider communications strategy.

The recent appointment of a Programme Manager was overdue. But the Partners need to give further consideration as to what support is required to ensure this role has real influence.

Key finding	Observation	Implication and Recommendation
The recent appointment of an overall Programme Manager was overdue. **However, given the current structure of the Programme, it is difficult to understand what real influence the Programme Manager will have outside of Fonterra.** **A formal PMO has not been established that includes the required capability to manage this complex Programme.**	• Both entities have appropriately embedded Programme project activity into their respective routine business processes. • Related to this point, we observe there are differing approaches to managing investment across the Programme. Fonterra operates an approach whereby Theme Leaders are responsible to the Fonterra Programme Manager. DNZ programmes are matrix orientated and sit alongside other complementary farmer-facing policy programmes. Leadership and investment by the SILs is therefore broader than just this PGP. • Theme 1 objectives 2.1 and 2.3 are subcontracted to Synlait and LIC and consequently are not overseen by the DNZ SILs. • We do not suggest one approach is superior relative to the other. Both organisations have developed structures that are appropriate for their requirements. • The recent appointment of an overall Programme Manager was overdue. As it stands, it will be challenging for the Programme Manager to interface and influence a disparate group of projects that are embedded within DNZ and other sub-contracted third parties.	• There is structure and management around objectives 2.2, 24, 2.5, and 2.6 and for completeness the LIC and Synlait work should flow through the same leadership for the theme. • This is more than increasing the coordination and administration capability. We anticipate the critical focus for these roles will be ensuring there are processes and mechanisms in place to transfer the resulting project activity output, or technology and capability, into outcomes, as needs to be demonstrated in line with PGP philosophy. Also importantly, these roles will greatly assist the Programme Manager's 'reach' into DNZ. • This recommendation also supports our recommendation for SoF 3 which highlights that more work is required to identify and establish greater linkages and synergies across the various Programme project activities, particularly focusing on integrating activity from the Pre- and Post-Farm Gate sides of the Programme. • Implementing a formal PMO will underpin the successful delivery of the Programme. It will improve operational efficiencies, enabling standardised processes and reporting. It will encourage more proactive and coordinated management of benefits realisation and will provide coaching and mentoring for project managers.

DNZ needs to build more transparent distinctions between its Programme activity and its other research and development investment.

Key finding	Observation	Implication and Recommendation
The Programme represents a relatively minor component of the overall research and development investment budgets for both Fonterra and DNZ. **Both entities have appropriately embedded the Programme project activity into their respective routine business processes.** **Fonterra has overlaid a very clear structure for managing the Programme as distinct from its other business activities.** **Conversely, there is significantly less clarity within DNZ as to how it segregates out its Programme activity from its wider research and development investment.**	• For clarity, this SoF does not relate to the Programme's financial processes. Both DNZ's and Fonterra's Programme processes were recently independently audited and were assessed as having robust and effective financial reporting processes. • The central issue in relation to this SoF is about ensuring investment is sufficiently ring-fenced from other internally funded activity so Programme funded activity is readily identifiable and its resulting output and outcomes are able to be demonstrated in line with PGP philosophy and tackling transformational challenges. • At the outset of the Programme, Fonterra established a structure whereby its individual Theme Leaders, responsible for delivering Themes 3 to 5, reported to Fonterra's own Programme Manager. • In contrast, DNZ programmes are matrix orientated and sit alongside other complementary farmer-facing policy programmes. Leadership and investment by the SILs is therefore broader than just this PGP. • Theme 1 objectives 2.1 and 2.3 are subcontracted to Synlait and LIC and consequently are not overseen by the DNZ SILs. • More generally, compared with DNZ, Fonterra appears to maintain a heightened awareness that the Programme needs to be specific and distinct from other research and development activity.	• Consistent with the recommendation in SoF 9, DNZ needs to consider what actions it can take to ensure it can better manage its Programme activity as distinct from its other business activities. There is structure and management around objectives 2.2, 24, 2.5, and 2.6 and for completeness the LIC and Synlait work should flow through the same leadership for the theme. • We believe this is more than increasing the administration capability, but rather we anticipate the critical focus for these roles will be ensuring there are processes and mechanisms in place to transfer the resulting project activity output, or technology and capability, into outcomes, as needs to be demonstrated in line with PGP philosophy. • Further, these roles will greatly assist the Programme Manager's 'reach' into DNZ.

Financial forecasts should show the anticipated 'whole of Programme investment' or what amount of investment is required to solve the identified problems needing PGP intervention.

Key finding	Observation	Implication and Recommendation
The Programme's financial forecast information does not provide sufficient transparency as to where further investment is anticipated to be spent. **As at June 2014 there was around $20 million of Post-Farm Gate funding commitments related to developing or unscoped projects. It is yet to be determined where that funding commitment will be invested.** **On the Pre-Farm Gate side, further investment beyond the current funding year was fully allocated.**	• We appreciate that the funding approval process has been intentionally and pragmatically designed to be fluid and agile, which appropriately reflects the principle that innovation activity is not a 'paint-by-numbers' process. • Annual plans are the primary process for determining how funding is allocated within a particular funding year. There are also discretionary processes by which the PSG may reallocate funding / budgets between Objectives within a funding year. • Previously, Theme level budgets were prepared in the annual plans which showed expected spend over the life of the Programme. However, currently the Programme's financial forecast information does not provide sufficient transparency as to where further investment is anticipated to be spent beyond the current funding year. We believe it would be useful to better understand the anticipated 'whole of Programme investment' or what amount of investment is required to solve identified problems and needs PGP intervention to achieve contractual objectives and outcomes. • As at June 2014, around $20 million of Post-Farm Gate funding commitment related to developing or unscoped projects. Effectively this funding had not been allocated (provisionally or otherwise) to a targeted area requiring PGP intervention. However, this allows flexibility as more 'expensive' activities are planned, for example clinical trials which may or may not proceed, depending on findings.	• We believe it makes sense to 'have a view' at the outset as to what resources and investment are required to achieve a particular outcome, and the Programme funding commitment should be broken down accordingly. • Naturally as the project activity progresses, plans will evolve and change and the Programme already accommodates flexibility in this regard. Forecast 'whole of Programme' investment analysis needs to be updated in line with the Programme progress as to identify potential investment shortfall or surplus. • We recommend the Programme's financial forecasts are prepared showing the anticipated 'whole of Programme investment' or what amount of investment is required to solve the identified problems needing PGP intervention. Forecasts need to be periodically rolled-forward and updated as the Programme progresses. • Benefits mapping should also be aligned and integrated with the commissioning of new projects.

Across the Programme there a range of opportunities for greater consistency and coordination of processes.

Key finding	Observation	Implication and Recommendation
While our overall view is that the Programme is generally well managed, we believe there are a range of opportunities to better standardise processes across the Programme.	• A centralised Programme Manager and formal PMO capability will be able to provide greater emphasis on identifying opportunities to better standardise processes and reporting. Some specific opportunities are noted as follows: – With regards to expert review panels, using standardised reporting templates, together with maintaining a centralised log of recommendations and actions (and rebuttals). – Using more consistent language and definitions to describe Programme activity. For example, Pre-Farm Gate and Post-Farm Gate have different meanings for Objectives and Milestones. – Greater consistency in the presentation of financial reporting and analysis. For example, Pre-Farm Gate and Post-Farm Gate have different approaches to reporting administration and also developing (yet to be scoped) projects. – Maintaining registers of information relevant to the important outputs and achievements of the Programme, such as participation of graduate and post-doctoral fellows including successful completion of study or finding permanent employment. • We appreciate that any process standardisation and other process improvements need to be practically implemented with regards to the resulting net benefit.	• We recommend the Programme Manager undertakes an assessment of the opportunities for greater consistency and increased process coordination across the Programme. Potential areas of opportunity are highlighted in the observations opposite.

This point in the Programme provides a good opportunity for the PSG to reconsider its composition and what additional skills might be needed to see the Programme through to completion.

Key finding	Observation	Implication and Recommendation
The members of the PSG we spoke to all confirmed that they believe the PSG is functioning well and there is a good balance of experience and expertise around the PSG table. We agree with this self-assessment. **But we also believe at this point in the Programme it is timely for the PSG to reconsider its composition and skills needed.**	• We believe that at the moment the PSG is appropriately balanced. This view was echoed by the PSG. In particular, it was highlighted that there is currently a very good mix of experience and knowledge from across the value chain, covering finance, marketing, manufacturing and the applied, agricultural and food sciences. • We understand that the PSG meetings are underpinned by constructive discussions between Partners and MPI. This may not have been the case from the outset. Other observers and non-voting participants also provide important contributions to better understanding key issues, working through options and arriving at consensus views. • As highlighted in SoF 14, we anticipate that as the Programme approaches its completion date, the PSG will need to increase its focus on ensuring outputs are transitioning into outcomes.	• We recommend that the PSG consider if a change is needed in its governance skills and expertise, and related support, in order to see the Programme through to completion. For example, is there any merit in structuring the PSG with an independent Chair? • Ultimately the PSG will be best placed to form its own view as to optimal composition as the Programme moves to the conclusion of Programme funding and the projects are transitioned to a BAU environment.

As the Programme approaches its completion date, quarterly reporting will need to evolve to support increased PSG focus on ensuring outputs are transitioning into outcomes.

Key finding	Observation	Implication and Recommendation
After a prolonged settling down period the Programme has now established effective governance oversight processes. **From an independent review perspective, while the quarterly reports are comprehensive and represent significant improvements from previous reporting, they do not appear to readily support or direct the PSG to focus on the relevant strategic issues and priorities.** **We anticipate that as the Programme approaches its completion date, quarterly reporting will need to evolve to support greater PSG focus on ensuring outputs are transitioning into outcomes.**	• Our focus was primarily on the current and future state of the Programme. To this end, our observation (backed up by other recent reviews including by the Office of the Auditor-General or OAG) was that there was at least a two year settling-in period before coordinated Programme oversight processes were effectively operating. • We believe that the Programme currently has effective governance oversight processes in place, which are complemented by comprehensive high quality reporting. In this regard, Programme management should be commended for making significant improvements recently, the benefits of which are yet to be fully realised. • From an independent review perspective, while the quarterly reports are very comprehensive and certainly represent significant improvements from previous reporting, they do not readily support or direct the PSG to focus on the relevant strategic issues and priorities. • As the Programme progresses to completion, the quarterly reporting will need to evolve to support a greater focus on ensuring outputs are transitioned into outcomes. This is also linked to the need for the implementation of a benefits realisation framework that will ensure the tracking and measurement of benefits beyond the conclusion of Programme funding. • Further, following the appointment of the overall Programme Manager, and greater emphasis on the standardisation of Programme processes, there will be a range of further opportunities for quarterly reporting improvements.	• In the spirit of continuous improvement, we recommend further opportunities for quarterly reporting improvements are considered. Some specific areas may include: – Increased focus on benefits realisation and communication of benefits and other opportunities as related to SoF 1. – Better presenting the ‘whole of Programme’ investment as related to SoF 11. – Reflecting the benefits of improved coordination and standardisation of processes across the Programme as related to SoF 12. – Also consider more opportunities for Theme Leaders to present directly to the PSG with regards to key issues and strategic challenges within each Theme. This may be done on a rotating annual basis.

The annual planning process should be enhanced to prepare the Programme beyond the conclusion of Programme funding in 2018.

Key finding	Observation	Implication and Recommendation
The Programme has less than 3 years to run and we expect to see the annual planning process incorporating activities to prepare the transition from the Programme to a BAU environment. This will include but not be limited to: • **Building the PMO and the key resources required to support this transition.** • **Developing benefits realisation and tracking processes that can be transitioned.** • **Continuity planning – handover of the projects to organisations who will provide a continuity of service.**	• To date the Programme has been focused on delivering interim milestones and outputs within their own project scopes. • Programme leadership is only just turning its mind to how the Programme will prepare for and deliver ongoing benefits after its conclusion in 2018. Currently there is no comprehensive plan. • There is less than 3 years of the Programme to run and it is now time for the Programme to plan and prepare for the conclusion of Programme funding and ensure that each project has a clear pathway to continue to deliver the benefits. Preparations should include: – An organisation has accepted the responsibility to continue to deliver the products and / or services; – A funding model has been identified, agreed and proven to ensure continuity; – All intellectual property and other commitments have been honoured; – Training and upskilling of individuals who will deliver beyond Programme funding (assuming they are new); and – All project documentation has been maintained and handed over.	• We recommend that a comprehensive plan is prepared by the Programme Manager in relation to the requirements for the Programme to transition into a BAU environment. Importantly, this plan should also confirm what is not expected to be completed and how this is to be dealt with. • This plan should then be incorporated into the annual planning cycle and be adapted to incorporate the activities needed to move the Programme into BAU at the conclusion of the Programme funding in 2018.

Summary of Recommendations

Reference	Recommendations
1. SoF 1 – 3 Benefits and Communications	• As a matter of urgency the Programme should commit to the development of a benefits realisation and tracking framework. • Benefit targets should be attributed to the Themes and the underlying major workstreams.
2. SoF 1 – 3 Benefits and Communications	• In parallel, MPI needs to progress the development of an overarching benefits framework which will integrate the benefits from its wider PGP investment portfolio. We understand progress is being made towards this by MPI.
3. SoF 1 – 3 Benefits and Communications	• MPI, together with the PSG, should arrange a planning workshop to explore the essential design elements of a benefits realisation and tracking framework for this Programme and also understand how this will integrate into an overarching benefits framework at a portfolio level.
4. SoF 1 – 3 Benefits and Communications	• More work is required to identify and establish greater linkages and synergies across the various project activities within the Programme, particularly focusing on integrating activity from the Pre- and Post-Farm Gate sides of the Programme. • This should be incorporated into the development of a benefits realisation framework.
5. SoF 7 Benefits and Communications	• MPI should better communicate its interpretation of ‘beyond business as usual’ for programme activities throughout the life of the programme.
6. SoF 8 Benefits and Communications	• Spillover activities and related targets should be identified as part of the annual planning process. The achievement of the spillover opportunities should be actively managed and incorporated into the overall benefits monitoring process, and into a wider benefits communication strategy.

Summary of Recommendations

Reference	Recommendations
7. SoF 9 – 10 **Resourcing, Management and Governance**	• We recommend that the Programme Manager's remit should be broadened through the establishment of a formal PMO, which will oversee all project activity and ensure there are appropriate mechanisms and processes in place for transferring resulting technology and outputs into outcomes across the Programme.
8. SoF 9 – 10 **Resourcing, Management and Governance**	• The PSG should determine the specific responsibilities and capabilities that will be needed within the PMO to maximise the likelihood of achieving the intended outcomes for this Programme.
9. SoF 9 – 10 **Resourcing, Management and Governance**	• There is structure and management around objectives 2.2, 24, 2.5, and 2.6 and for completeness the LIC and Synlait work should flow through the same leadership for the theme. • DNZ should consider what other actions it can take to ensure it can build more transparent distinctions between its Programme activity and its other research and development investment.
10. SoF 12 **Resourcing, Management and Governance**	• The PMO should undertake an assessment of the opportunities for greater consistency and increased process coordination across the Programme. Some potential areas or opportunities for process improvement are identified in the Report.
11. SoF 15 **Resourcing, Management and Governance**	• The PMO should prepare a detailed plan in connection with the requirements for the Programme to transition to a BAU environment and also confirming what is not expected to be completed and how this is to be dealt with. This plan should be incorporated into the annual planning cycle and be adapted to incorporate the activities needed to move the Programme into BAU at the conclusion of the Programme funding in 2018.
12. SoF 14 **Resourcing, Management and Governance**	• The PMO should consider opportunities for further quarterly reporting improvements. Some potential areas or opportunities for improvement are identified in the Report. • Also consider the merits of meeting six times a year as the Programme nears completion and is entering transition phases.

Summary of Recommendations

Reference	Recommendations
13. SoF 6 **Resourcing, Management and Governance**	• Annual planning process should be used to confirm and allocate resources needed to embed and sustain the certification and accreditation processes (and other outputs) which have been developed through Pre-Farm Gate project activity.
14. SoF 11 **Resourcing, Management and Governance**	• Financial forecasts should show the anticipated 'whole of Programme investment' or what amount of investment is required to solve the identified problems needing PGP intervention. Forecasts need to be periodically rolled-forward and updated as the Programme progresses. Benefits mapping should also be aligned and integrated with the commissioning of new projects.
15. SoF 13 – 14 **Resourcing, Management and Governance**	• PSG should consider the governance skills and expertise it needs, including assessing the value of an independent PSG member and / or chairperson, in order to see the Programme through to completion. Ultimately the PSG will be best placed to form its own view as to optimal composition as the Programme moves to the conclusion of Programme funding and the projects are transitioned to a BAU environment.

The Programme aims to transform the dairy value chain by creating new products, increasing on-farm productivity, reducing environmental impacts, and improving agricultural education.

Background

- Primary Growth Partnerships (PGPs) are government-industry partnerships to invest in research and innovation to boost the economic growth and sustainability of New Zealand's primary, forestry and food sectors.
- DNZ and Fonterra (the Partners) are leading a PGP programme which aims to transform the dairy value chain by creating new products, increasing on-farm productivity, reducing environmental impacts, and improving agricultural education (the Programme). The Programme is aligned to Pre-Farm Gate and Post-Farm Gate sub-programmes and further shaped into five Themes. DNZ and Fonterra lead the Pre- and Post-Farm Gate initiatives, respectively.
- The table opposite summarises the Programme's total budget as at June 2014. The analysis shows actual Programme investment to date as at June 2014 (PTD), budgeted investment for the year ending June 2015 (FY15B) and forecast investment to go beyond FY15B (PTG). The analysis also shows the investment contribution made by MPI and the respective Partners, and an overall analysis of cash and in-kind contribution.
- The Programme formally commenced in February 2011 with an agreement between MPI and the Partners to commit around $170 million of budgeted investment towards the Programme's Objectives over a seven year period (the Contract). DNZ received approval for go-early PGP funding (Sept 2010) before the final Contract was signed in April 2011.
- Other smaller industry investors in the Programme include Synlait Milk Limited (Synlait), Zespri Group Limited (Zespri) and Livestock Improvement Corporation (LIC); and to a lesser extent New Zealand Young Farmers (NZYF), Agriculture Services Limited (ASL) and Landcorp Farming Limited (Landcorp). These investors (Minor Partners) are not signatories of the Contract itself but their Programme-related commitments are sub-contracted to the Partners. The aspiration of the Programme is to generate recurring annual economic benefits from production improvements, efficiencies and the development of other Post-Farm Gate opportunities.

Programme Level Investment Analysis

$m	Act PTD	Budget FY15	Budget PTG	Total
Pre-farm gate:				
Theme 1: On-Farm Innovation	24.6	6.3	12.8	43.7
Theme 2: Capability and Capacity	29.3	8.0	16.9	54.2
Sub-total	**53.8**	**14.3**	**29.7**	**97.8**
Post-farm gate:				
Theme 3: Food Structures	13.7	5.4	5.4	24.5
Theme 4: Quality Management	4.3	1.8	3.9	10.1
Theme 5: Nutrition and Health	5.2	3.7	5.9	14.8
+ Other comprised:				
Administration	1.4	0.4	1.2	3.1
Unscoped projects	-	1.8	18.1	19.9
Sub-total	**24.7**	**13.2**	**34.5**	**72.5**
Total	**78.6**	**27.5**	**64.2**	**170.3**
Funding contributions:				
MPI	40.1	13.5	31.0	84.6
Fonterra	13.8	7.2	19.0	40.0
DNZ	16.0	4.2	9.0	29.3
Minor Partners	8.7	2.6	5.1	16.5
Total	**78.6**	**27.5**	**64.2**	**170.3**
Cash and in-kind funding:				
Cash	77.2	27.1	63.5	167.9
In-kind	1.3	0.4	0.7	2.4
Total	**78.6**	**27.5**	**64.2**	**170.3**

Source: Business Plan FY2015, DNZ, Fonterra

Our overriding objective was to provide an independent assessment of how the Programme is tracking towards its contracted outcomes or benefits.

Purpose of Report

- Deloitte was instructed by MPI to undertake a progress review of the Programme (the Progress Review). Specifically, the key objectives of this review as defined in our Term of Reference (TOR) were as follows:
  - Assess Programme progress to date as a whole, in each of the five Themes, and in particular the likelihood of the Programme delivering the expected outcomes;
  - Assess the sustainability of the expected outcomes from the Programme in the current economic and environmental context, including the identification of any key risks to achieving the contracted outcomes;
  - Provide assurance to MPI that Programme activities are 'beyond business as usual' (BAU) for the industry partners; and
  - Consider the degree of impact on identified potential additional benefits (spillover).
- Our work was not intended to provide an evaluation of the quality of the science itself. However, independent expert reviewers were sub-contracted by Deloitte to look at the management of the science and also capability development and delivery mechanisms, and further consider what actions have been taken following previously commissioned expert reviews. We did not consider the original rationale for the Programme or individual projects that have been approved for funding by the Programme's governing committee (PSG). We did not review commercially proven technologies transferred into Fonterra's BAU processes, and our work did not focus on financial management processes; all of which was agreed to be out of scope, as confirmed in the TOR. Our ability to provide a proper assessment of how the Programme is tracking towards its contracted outcomes or benefits was limited by the lack of a benefits realisation framework. We have been provided with case study analysis that demonstrates a track record of success, providing insight into the likelihood of success and potential benefits.
- Through these case studies and our enquiries we were provided anecdotal examples of innovations and capabilities, either already developed (achieved) or related projects that are progressing well against corresponding contractual milestones / objectives, and have the potential to deliver significant economic impacts and important industry change. This was useful in assisting us to form an overall assessment.
- Our conclusion highlights that on balance although we believe that there is a strong likelihood of the Programme achieving significant economic impacts and important industry change, in the absence of supporting analysis and evidence (which was not available and to prepare from source data would have been beyond the scope of our TOR) it would be premature to put an economic quantum or a timeframe on the achievement of potential benefits.

Limitations

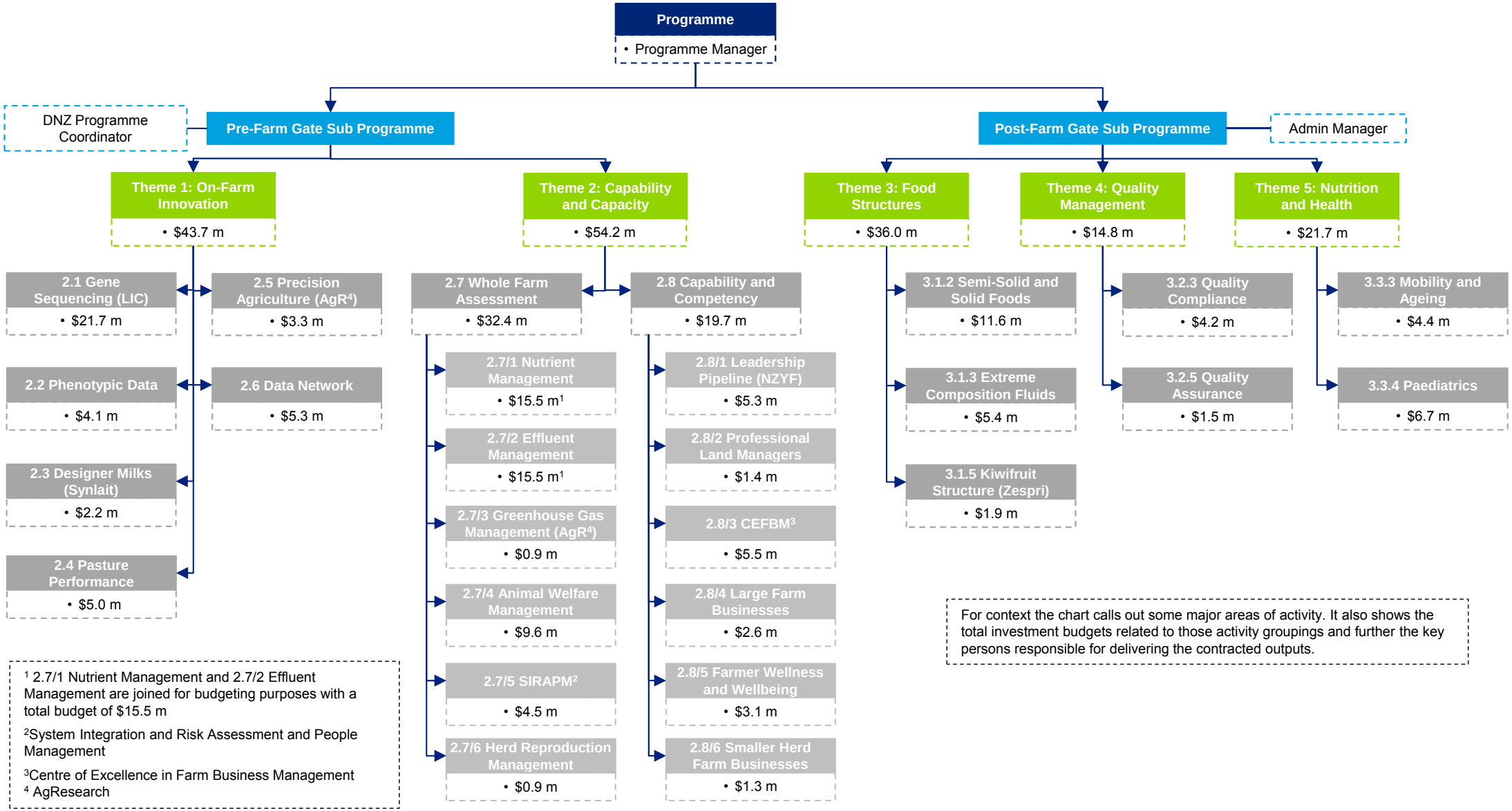
- In undertaking our assessment, we have relied upon and assumed without independent verification, the accuracy and completeness of all information that was provided to us. We have not corroborated the information received and, to that extent, the information may not be reliable. We accept no responsibility for matters not covered by our Report or omitted due to the limited nature of our review. We have evaluated the information provided through analysis, enquiry and examination for the purposes of forming our assessment. However, we have not verified the accuracy or completeness of any such information. Our Report has been prepared with care and diligence and the statements and conclusions in this Report are given in good faith and in the belief, on reasonable grounds, that such statements and conclusions are not false or misleading. We assume no responsibility arising in any way whatsoever for errors or omissions (including responsibility to any person for negligence) for the preparation of this assessment to the extent that such errors or omissions result from the reasonable reliance on information provided by others or assumptions disclosed in our Report or assumptions reasonably taken as implicit.

We have focused our assessment at the portfolio level or those areas likely to have the biggest impact on the potential outcomes of the Programme.

Deloitte Approach

- Our approach has largely followed the review plan or methodology that we discussed and agreed with the PSG at the initial scoping meeting in November 2014. At the PSG scoping meeting we also agreed a range of review questions that have provided a useful focus for approaching the Progress Review.
- These review questions were divided into two broad categories or (i) Governance and Execution and (ii) Problems and Benefits. The review questions are summarised in Appendix 2. Our Summary of Findings (SoF) on Pages 12 to 26 have followed a similar structure.
- We reviewed a range of base documentation materials, which importantly included the original business plan and other supporting feasibility analysis, contractual documentation, previous annual planning documentation, PSG quarterly reports and other PSG papers. We then conducted a range of planning meetings to get a better overall understanding of the Programme and the activities that are being undertaken.
- Based on the above we prepared a detailed scope and a supporting structured questionnaire. We also engaged and prepared scopes for two independent expert reviewers (the Expert Reviewers), who have respectively covered the areas of science quality management and management of on-farm capability development and delivery.
- We then undertook the detailed discovery phase of the Progress Review, conducting interviews with a range of people who are involved in the delivery and the day-to-day management of the Programme's project activity. The Expert Reviewers have also reviewed a range of detailed quality management and other independent expert panel review documentation. Our interviews also included discussions with MPI and the individual members of the PSG itself.
- The Programme is broken down into five strategic areas or Themes. Themes 1 to 2 are Pre-Farm Gate and Themes 3 to 5 are Post-Farm Gate. Common areas of activity beneath Themes are grouped into Objectives (Post-Farm Gate) or Milestones (Pre-Farm Gate). For consistency our Report only uses the term Objective to describe this level of activity within the Programme structure. Further description and explanation as to how the Programme is structured is provided on Pages 34 and 35.
- We primarily focused our detailed enquiries at the Objective level to enable us to prepare assessments for each Theme and the overall Programme itself. As agreed our detailed enquires were not exhaustive but were based on understanding sampled Programme activity. Effectively we have focused our assessment on those areas likely to have the biggest impact on the potential outcomes of the Programme.
- Deloitte has mostly focused on understanding the (i) progress to date (ii) likelihood of achieving contracted outcomes and (iii) key risk and challenges in respect of achieving contracted outcomes, whereas the Expert Reviewers primarily focused on understanding and confirming the quality of the management processes. Expert Reviewers' assessments have been integrated into the Deloitte analysis and informed our overall assessment and conclusions.
- Our Report includes an assessment at the overall Programme level which is then broken down by respective Theme assessments. Importantly our Report also includes a SoF which sets out key issues, observations and recommendations that we believe will need to be addressed in order to maximise the opportunity for successfully achieving the intended outcomes.

Introduction and Overview: Programme Structure and Investment



For context the chart calls out some major areas of activity. It also shows the total investment budgets related to those activity groupings and further the key persons responsible for delivering the contracted outputs.

[1] 2.7/1 Nutrient Management and 2.7/2 Effluent Management are joined for budgeting purposes with a total budget of $15.5 m

[2]System Integration and Risk Assessment and People Management

[3]Centre of Excellence in Farm Business Management

[4] AgResearch

Note: In addition to the Objectives shown above, each of the Themes contains either a Programme Management Objective (Pre-Farm Gate) or a Capability Resourcing Objective (Post-Farm Gate). The costs of these Objectives primarily relate to administration support (Pre-Farm Gate) or Academic Chairs, Theme Leader expenses and training (Post-Farm Gate).

Introduction and Overview: Programme Structure and Funding Processes

Programme Structure

- The chart on Page 34 above summarises how the Programme is broken down into five strategic areas or Themes which are intended to transform the dairy value chain as related to: (1) On-farm Innovation; (2) Capability and Capacity; (3) Food Structures; (4) Quality Management; and (5) Health and Nutrition.
- For clarity, unless otherwise explicitly stated, when we refer to the Programme we are referring specifically to the Transforming the Dairy Value Chain Primary Growth Partnership (or this Programme). Our Report provides summary analysis for each of these Themes and the underlying activities that are taking place. However, to assist the reader to better understand how the Programme is structured, we provide the following explanation and definitions of common terms:
  - Objectives and Milestones are defined in the Contract and represent the major common areas of activity beneath Themes. Essentially Objectives and Milestones are the same thing.
  - Objectives is the term used for Post-Farm Gate activity and Milestones is used for the Pre-Farm Gate activity. As highlighted earlier, for consistency, our Report only uses the term Objective to describe this level of activity within the Programme structure.
  - Projects are the activities that are undertaken in support of the Objectives and the Milestones. Projects are not specifically defined in the Contract but are approved by the PSG as aligned to defined Milestone and Objective achievement measures.
  - Project Outputs represent immediate project aims or outputs. They are specified in the Contract at the Objective / Milestone level.
  - Contracted Outcomes are the key overall indicators of success or benefits. They are specified in the Contract and are defined at the Theme and Sub-Programme levels.

Funding Processes

- Funding processes have been intentionally and pragmatically designed to be fluid and agile, which appropriately reflects the principle that innovation activity is not a paint-by-numbers process.
- Programme funding is paid on invoice for work completed. The Contract sets out a range of Partner requirements and procedures related to the Programme funding arrangements.
- For each funding year, the annual budget effectively sets out the approved funding intentions. This is specified to an Objective level.
- The annual budget includes funding related to both approved projects and also developing projects, or areas that are under consideration but not yet fully defined and are still subject to final PSG approval. Funding commitments beyond the immediate budget year represent a contractual commitment that is specified only at the sub-programme level.
- Under the current contract rules, up to $500,000 of annual budget (PGP only) funding may be redirected within an Objective by the PSG. Redirection of funds above this threshold, or between Objectives (even if part of the same overarching Theme) currently requires contract variation. At a recent PSG quarterly meeting it was proposed that the above threshold is amended to allow up to $1 million of funding (PGP and industry total) to be redirected within a Theme, subject to PSG approval. We understand the proposed Contract amendment is under consideration and, if approved, will be adopted at a future quarterly or annual PSG meeting.
- The Contract provides mechanisms for amending and approving variations to the Partner funding commitments in relation to ‘change events’. These typically relate to the reduced likelihood of achieving intended benefits and / or other legal risks and potential consequences.

Introduction and Overview: Timeline

Programme Development

- The original Transforming the Dairy Value Chain Programme proposal was submitted in November 2009. Following the approval of the proposal, the business plan was submitted in July 2010 with the final contract signed in April 2011. While the Programme formally commenced in February 2011, DNZ received authorisation for go-early PGP funding in September 2010.
- Each co-investor has two members appointed to the Programme Steering Group (PSG). The Chairperson is rotated by agreement with the initial Chair appointed in 2011 and a new Chair appointed in 2014. PSG membership has had relatively consistent representation over the life of the Programme.
- A significant change to Objective 2.1 occurred when ViaLactia Biosciences Limited (VLB) withdrew from the Programme in 2012. The Objective was amended to accelerate sequencing and analysis activity aligned with LIC's strategy, as LIC agreed to increase its investment to fund the remaining industry co-investment.
- Major terminations from the Post-Farm Gate Themes have included the Restructuring Lactose Objective (terminated due to a large permanent change in demand for lactose), Natural Cheese Slice projects (terminated due to the effect of in market regulatory constraints) and Objective 3.2.2 Process Design (all scoped projects in this Objective were completed and Fonterra decided to not invest further in this area).
- Financial process reviews were recently undertaken on both Fonterra (in December 2013) and DNZ (March 2014) and the OAG also recently undertook a review in February 2015 of the PGP process and programmes.

Timeline of Key Events

2009/10

- Nov 2009: Transforming the Dairy Value Chain Programme proposal submitted
- Jul 2010: Business plan submitted
- Sep 2010: Go early approved for DNZ
- Nov 2010: BCG benefits assessment

2011

- Jan 2011: Chair of PSG appointed
- Feb 2011: Programme commenced
- Apr 2011: Programme contract signed
- Jun 2011: Objective 3.1.4 Restructuring Lactose terminated
- Sep 2011: New Fonterra CEO appointed

2012

- Mar 2012: Fonterra strategy refresh
- Jun 2012: Objective 3.2.2 Process Design completed and terminated
- Jun 2012: New MPI appointment to PSG
- Nov 2012: VLB exits Programme

2013

- Feb 2013: New Fonterra appointment to PSG
- Aug 2013: New MPI appointment to PSG
- Aug 2013: New Fonterra appointment to PSG
- Dec 2013: Financial process review – Fonterra

2014

- Feb 2014: New Chair of PSG appointed
- Mar 2014: Financial process review – DNZ
- Aug 2014: PSG undertakes strategic review of Programme governance

2015

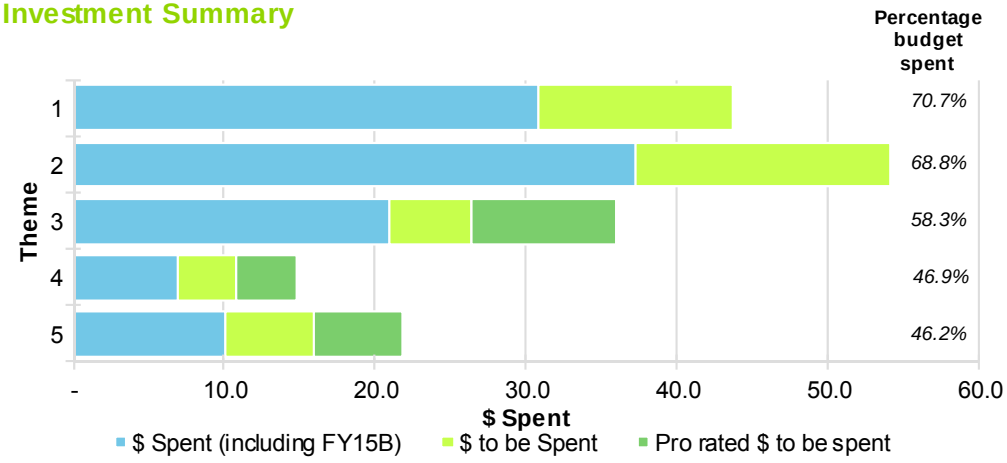
- Feb 2015: OAG PGP review report published
- July 2015: Deloitte mid-term review released

Over time the Programme output appears to have gathered momentum. The projects are generally well managed and are meeting specified contracted outputs and technical milestones.

Current State Analysis

- The analysis opposite shows total Programme investment across the Themes. This analysis is intended to be illustrative and for presentational consistency we have prorated Pre-Farm Gate administration costs, and Post-Farm Gate administration costs and unscoped investment across the corresponding component Themes, respectively.
- By the end of the current funding year FY15 $106.1 million will have been spent with $64.2 million more to be spent by the end of the Programme. This implies at the end of FY15B the Programme will be around 62% through its planned investment budget. The analysis also highlights that the Pre-Farm Gate work-streams are around 70% through its planned investment budget compared with 52% for the Post-Farm Gate work-stream.
- Programme momentum and output has increased over time. The range of outputs and achievements to date reflect the wide range of activities across the Themes. For context a selected summary of the outputs to date follow:
  - More than 1,600 trainers have been up-skilled for provision of advice and training to farmers as a result of training programmes developed or revised.
  - Rural Business Network launched in 2012 to enable rural based business people to participate in professional development.
  - Audited Nutrient Management System has been developed and implemented for the majority of the industry.
  - As at May 2014 13 markers for production, differentiated product, fertility and animal health had been discovered.
  - Mozzarella projects have provided two NPD projects, along with insights to improve the operation of the Clandeboye Plant.
  - Developed preliminary evidence to support the role of a range of dairy proteins in muscle maintenance in middle aged men and a first generation technology for detecting economic adulteration of milk has been developed and is being trialled.

Investment Summary



Source: Business Plan FY2015, DNZ, Fonterra
Pre-Farm Gate administration costs have been prorated against its corresponding Themes, as has Post-Farm Gate administration costs and unscoped investment / unallocated funding.

Analysis below summarises investment by Theme and calls-out some of the major workstreams.

2.1 Gene Sequencing is the largest Theme 1 Objective with a budget of $21.7 million which is 50% of this Theme and 13% of the Programme.

It aims to increase genetic gain through improved accuracy of estimating cow genomic Breeding Value (BV).

2.8 Capability and Competency is the second largest Theme 2 Objective with a budget of $19.7 million which is 36% of this Theme and 12% of the Programme.

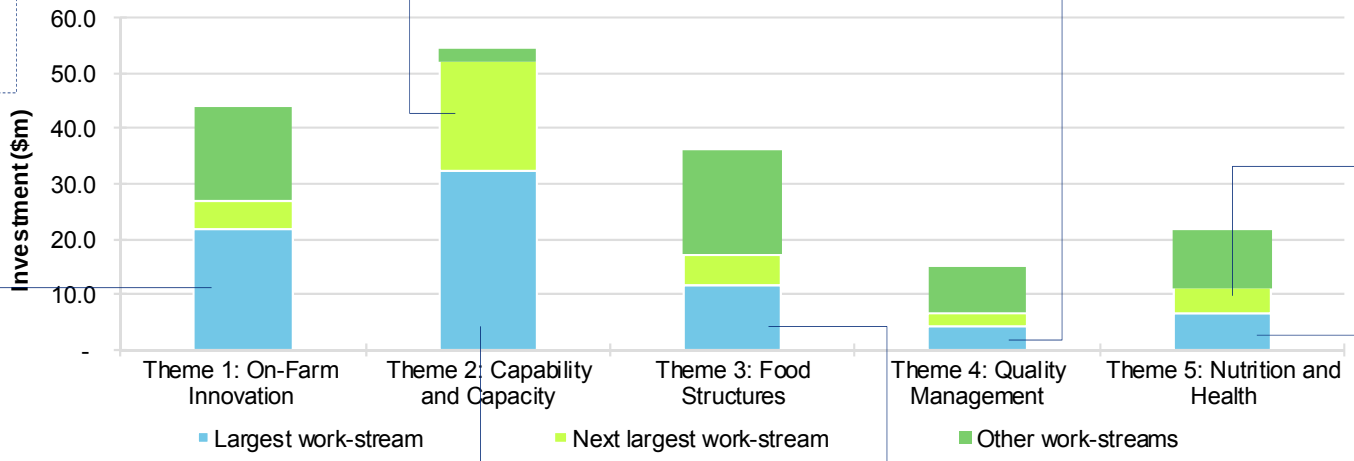
It aims to provide knowledge directly to farmers and upskill the RPs that support them. Major areas of investment focus on building better linkages between academics, RPs and farmers and providing a leadership pipeline for the industry.

3.2.3 Quality Compliance is the largest Theme 4 Objective with a budget of $4.2 million which is 28% of this Theme and 2% of the Programme.

The main area of focus is the development of Minitools for process control in dairy factories.

3.3.3 Mobility and Ageing is the second largest Theme 5 Objective with a budget of $4.4 million which is 20% of this Theme and 3% of the Programme.

It is related to the development of science to support new positioning for consumer brand Anlene.



Source: Business Plan FY2015, DNZ, Fonterra

Post-Farm Gate administration costs and unscoped investment / unallocated funding has been prorated against its corresponding Themes.

3.3.4 Paediatrics is the largest Theme 5 Objective with a budget of $6.7 million which is 31% of this Theme and 4% of the Programme.

It is related to the development of science to support consumer brand Anmum.

2.7 Whole Farm Assessment is the largest Theme 2 Objective with a budget of $32.4 million which is 60% of this Theme and 19% of the Programme.

It aims to upskill RPs and covers a range of areas. Major areas of investment are nutrient and effluent management (including certification and accreditation schemes) and animal welfare.

3.1.2 Semi-Solid and Solid Foods is the largest Theme 3 Objective with a budget of $11.6 million which is 32% of this Theme and 7% of the Programme.

Major projects are related to Mozzarella Cheese and aimed at reducing processing costs while maintaining quality. UHT Creams is another significant project and there are also other smaller areas of work in this Objective.

Pre-Farm Gate, Themes 1 and 2, has a total investment budget of $97.8 million (57%) and Post-Farm Gate, Themes 3 to 5, has a total investment budget of $72.5 million (43%).

Current State Analysis

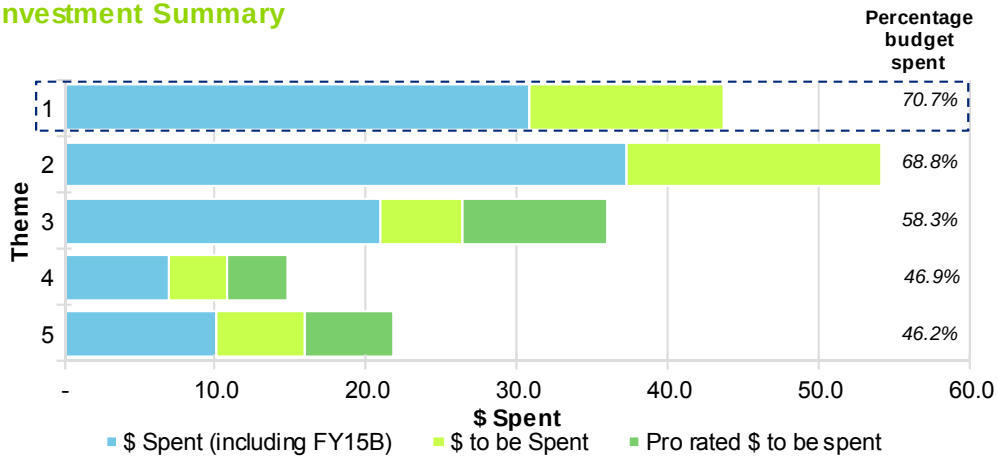
- The analysis on the previous page shows total Programme investment by Theme. Pre-Farm Gate, Themes 1 and 2, has a total investment budget of $97.8 million (57%) and Post-Farm Gate, Themes 3 to 5, has a total investment budget of $72.5 million (43%). As highlighted above for presentational consistency we have prorated Pre-Farm Gate administration costs, and Post-Farm Gate administration costs and unscoped investment across the corresponding component Themes. Within each of the Themes there are some relatively significant tranches of investment.
- Theme 1 On-farm Innovation has a total investment budget of $43.7 million (26% of Programme). Theme 1 is focused on developing a range innovative technologies, opportunities and information to enable future sustainable dairy production growth with a reduced environmental footprint. The most significant work-stream relates to Objective 2.1 Gene Sequencing, which has an investment budget of $21.7 million (around 50% of the Theme and 13% of overall Programme).
- Theme 2 Capability and Capacity has a total investment budget of $54.2 million (32% of Programme). Theme 2 is focused on developing an improved farmer decision making, and therefore on-farm productivity, by increasing the capability and capacity of the dairy industry. Theme 2 has two significant workstreams: Objective 2.7 Whole Farm Assessment and Objective 2.8 Capability and Competency, which have respective investment budgets of $32.4 million (around 60% of the Theme and 19% of overall Programme) and $19.7 million (around 36% of the Theme and 12% of overall Programme).
- Theme 3 Food Structures has a total investment budget of $36.0 million (21% of Programme). Theme 3 focuses on developing new ways to address the challenges of food design, enabling the development and manufacture of complex foods and food ingredients required to meet a growing consumer demand for healthier customised foods. The largest work-stream, Objective 3.1.2 Semi-Solid and Solid Foods, has an investment budget of $11.6 million (around 32% of the Theme and 7% of overall Programme).
- Theme 4 Quality Management has a total investment budget of $14.8 million (9% of Programme). Theme 4 is focused on creating new tools to enable efficient and sustainable dairy processing technologies that will provide competitive advantages. The largest work-stream, Objective 3.2.3 Quality Compliance, has an investment budget of $4.2 million or (around 28% of the Theme and 2% of overall Programme).
- Theme 5 Nutrition and Health has a total investment budget of $21.7 million (13% of Programme). Theme 5 aims to deliver opportunities to add value to branded nutritional dairy products in an international market where there is an increased requirement for robust science to support health claims and communications. Theme 5 has two significant workstreams, Objective 3.3.3 Mobility and Ageing and Objective 3.3.4 Paediatrics, which have respective investment budgets of $4.4 million (around 20% of the Theme and 3% of overall Programme) and $6.7 million (around 31% of the Theme and 4% of overall Programme).
- The above analysis shows that Objectives 2.7 and 2.8 are among the largest areas of investment in the Programme. More information is provided below on the major activities within each of these Objectives:
  - Projects related to upskilling and certifying RPs in nutrient and effluent management are a major investment area in Objective 2.7. By the end of this funding year FY15B, around $12.2 million will be spent on these projects, leaving a further $4.0 million to be spent by the end of the Programme. This implies that these projects are currently around 75% through their programme of investment.
  - Projects related to building linkages between academics, RPs and farmers are a major investment area in Objective 2.8. By the end of this funding year FY15B, around $3.9 million will be spent on these projects, leaving a further $1.7 million to be spent by the end of the Programme. This implies that these projects are currently around 70% through their Programme of investment.

Theme 1 Summary Analysis: Overview

Theme Overview

- The focus on Theme 1 is to provide a step change in the way knowledge and technologies are delivered to farm practitioners to enable sustainable growth in New Zealand's dairy production, without increasing the environmental footprint. Investment is focused on developing innovative technologies and resources in three key areas: resilient cows, on-farm technologies and information, and include a mix of Industry Push and Demand Pull projects.
- The analysis opposite shows total Theme 1 investment relative to other Themes over the life of the Programme. For presentational consistency of this illustrative analysis, we have prorated Pre-Farm Gate administration costs across the corresponding Themes (50/50). This analysis shows that Theme 1 investment is around $43.7 million or 45% of Pre-Farm Gate investment and 26% of overall Programme investment.
- By the end of this funding year FY15B, around $30.9 million will be spent, and a further $12.8 million will be spent by the end of the Programme. This implies that Theme 1 is around 71% through its investment.
- DNZ is lead co-investor for Theme 1. Four of the six Objectives underpinning this Theme are managed by DNZ. DNZ has sub-contracted other parties to wholly deliver the two commercial objectives:
  - LIC, in relation to increasing the rate of genetic gain in the national dairy herd (2.1 Increased Genetic Gain through Gene Sequencing); and
  - Synlait, to develop new products for commercialisation by Synlait (2.3 Designer Milks) by developing farm management and manufacturing techniques. Synlait has collaborated and engaged research support from various universities to support them in this work.
- In addition, DNZ has engaged third party providers to assist in the management and delivery of contracted milestones.

Investment Summary



Source: Business Plan FY2015, DNZ, Fonterra
Pre-Farm Gate administration costs have been prorated against its corresponding Themes, as has Post-Farm Gate administration costs and unscoped investment / unallocated funding.

Theme 1 Summary Analysis: Overview

Objectives

- The table opposite summarises the investment to date and further planned investment by Objective as at June 2014. Theme 1 Objectives fall within three areas:

Resilient Cows

- 2.1 Increased Genetic Gain through Gene Sequencing. Use gene sequencing technologies to increase genetic gain in dairy herds through improved accuracy of estimating cow genomic BV.
- 2.2 Increased Genetic Gain through Improved Phenotypic Data. Use phenotypic data to increase genetic gain in dairy herds through improved accuracy of estimating cow BV.

On-Farm Technologies

- 2.3 Designer Milks. Develop farm management and manufacturing techniques to provide Designer Milks for production of speciality dairy-derived products.
- 2.4 Improved Pasture Performance. Define forward traits and management practices for pasture persistency to improve on-farm pasture performance.
- 2.5 Precision Agriculture. Develop precision technologies, with technology suppliers and farmers, to improve and optimise technology farm systems.

Information:

- 2.6 Dairy Data Network. Consolidate a Dairy Industry Database Network with infrastructure and sharing capability to improve efficiency and effectiveness of farmer and agribusiness decision making.

- In addition, Objective 1.1 relates to support provided for the management of Theme 1, having been pro-rated across the Pre-Farm Gate Themes (50/50). The analysis opposite highlights Objectives 2.1, 2.4 and 2.6 as the major areas of activity, having total investment of $21.7 million (50%), $5.0 million (11%), and $5.3 million (12%), respectively. We interviewed key personnel in relation to these Objectives, as presented later in this section.

Objective Level Investment Analysis

$m	Act PTD	Budget FY15	Budget PTG	Total
Theme 1: On-Farm Innovation				
1.1 Programme Management*	1.1	0.3	0.6	2.0
2.1 Gene Sequencing	11.3	3.5	6.9	21.7
2.2 Phenotypic Data	2.3	0.6	1.2	4.1
2.3 Designer Milks	1.2	0.3	0.7	2.2
2.4 Pasture Performance	2.8	0.7	1.5	5.0
2.5 Precision Agriculture	2.0	0.4	0.9	3.3
2.6 Data Network	3.9	0.5	1.0	5.3
Total	**24.6**	**6.3**	**12.8**	**43.7**

Source: Business Plan FY2015, DNZ

Theme 1 Summary Analysis: Timeline

Theme Development

- Theme 1 Objectives are delivered through a collection of six Objectives that are primarily managed independently of each other. Given the diversity of the projects and the number of reported achievements it is not practical to list them all. Therefore the following is a brief summary of the key events and influencing factors in the development of Theme 1. The chart opposite also highlights some of these events. In addition to these we note that many workstreams (especially 2.1 and 2.5) have been supported by the publication of research findings to experts, industry and / or steering groups.
- One of the most significant changes to Objective 2.1 occurred when VLB withdrew from the Programme in 2012. The Objective was amended to accelerate sequencing and analysis activity aligned with LIC's strategy, such as the addition of the NZ Dairy Reference Genome project, as LIC agreed to increase its investment to fund the remaining industry co-investment. Regular (six-monthly) Scientific Advisory Board (SAB) reviews have also directed and refined Objective activity and investment. Gene tests for cow health and production traits, and gene markers, are being implemented into industry.
- A major success for Objective 2.2 occurred in December 2011 when CRV-Ambreed marketed FE-tolerant bulls. The New Zealand Animal Evaluation Limited (NZAEL) has played an important role in scoping, developing and recommending activity and investment under Objective 2.2 (i.e. Go / No decision points). For example, a new milestone, New Traits or Phenotypes, was added in July 2013 to identify and potentially incorporate new traits or phenotypes into Breeding Worth (BW) calculations that are valued by farmers, and in September 2014 the NZAEL SAC validated the enhanced Fertility BV approach.
- Key changes to Objective 2.3 occurred following the termination of Healthy Milk Herd Development after preliminary findings suggested limited commercial potential. Funding was subsequently redirected to accelerate an existing project within the Programme as well as a new High Value Milk / Colostrum Extracts project (2013/14 Annual Plan).

Timeline of Key Events

2011

- Feb 2011: Programme commenced.
- Sep 2011: Research evaluating activity meters for heat detection complete
- Dec 2011: CRV-Ambreed marketing FE-tolerate bull team

2012

- Jun 2012: Pasture persistency study methodology developed, with PSG sign-off.
- Oct 2012: Research into nutrient use efficiency terminated.
- Nov 2012: VLB exits Programme. NZ Dairy Reference Genome project added.

2013

- May 2013: Release of field evaluation Automated Mastitis Detection (AMD) system protocols.
- Jun 2013: Four gene tests for cow health and production traits implemented.
- Aug 2013: Formal agreement between LIC and DNZ for transition of Dairy Core Database into industry good
- Oct 2013: Fertility Focus Report upgrade implemented
- Oct 2013: Pasture Growth Forecaster launched
- Dec 2013: Ryegrass cultivar survival findings communicated to plant breeders

2014

- May 2014: Thirteen gene markers for production, differentiate product, fertility and animal health discovered
- Jun 2014: Dairy Data Standard Code of Practice released
- Sep 2014: Screening of sires for reproduction traits implemented
- Sep 2014: NZAEL SAC validation of enhanced Fertility BV approach
- Dec 2014: Launch of Dairy Industry Good Animal Database (DIGAD, formerly Dairy Core Database)

2015

- Jan 2015: Sleepiz milk power launched through a Korean pharmacy chain
- Feb 2015: Independent review of Objective 2.4.

Theme 1 Summary Analysis: Timeline

- Other changes have been made in response to independent advice and Synlait's priorities. A significant achievement for Objective 2.3 was the release of Sleepiz milk powder through a Korean pharmacy chain in January 2015.
- No major changes have occurred to Objective 2.4 since the sign-off of the research methodology by the PSG in June 2012, partly as it is a long-term research programme and therefore any changes should reflect refinements of approach rather than new directions. Regular feedback from the Forage Value Technical Working Group has guided research activity and an independent review was completed in February 2015. Two additional milestones were added to reflect the phenotypic and genotypic work being undertaken at the sub-project level activity. In December 2013, ryegrass cultivar survival findings were communicated to plant breeders for use in plant breeding programmes.
- Research into nutrient use efficiency under Objective 2.5 was halted after DNZ became aware of similar (and new) work funded by MBIE from October 2012 (2013/14 Annual Plan). Guidance provided by the Farmer Steering Group (FSG) resulted in a greater focus being placed on on-farm feeding and nutrition applications. Key events include the completion of research evaluating activity meters for heat detection (Sept 2011) and the release of field evaluation Automated Mastitis Detection system protocols (May 2013).
- For Objective 2.6, a formal agreement signed between LIC and DNZ (one year behind target) enabled the transfer of the Dairy Core Database into industry good stewardship (Aug 2013), and ultimately the launch of the Dairy Industry Good Animal Database in December 2014 (outside of the Programme). Other key milestones include the completion of the upgrade to the Fertility Focus Report and launch of Pasture Growth Forecaster in October 2013, as well as the release of the Dairy Data Standard Code of Practice in June 2014.

Timeline of Key Events

2011

- Feb 2011: Programme commenced.
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2015

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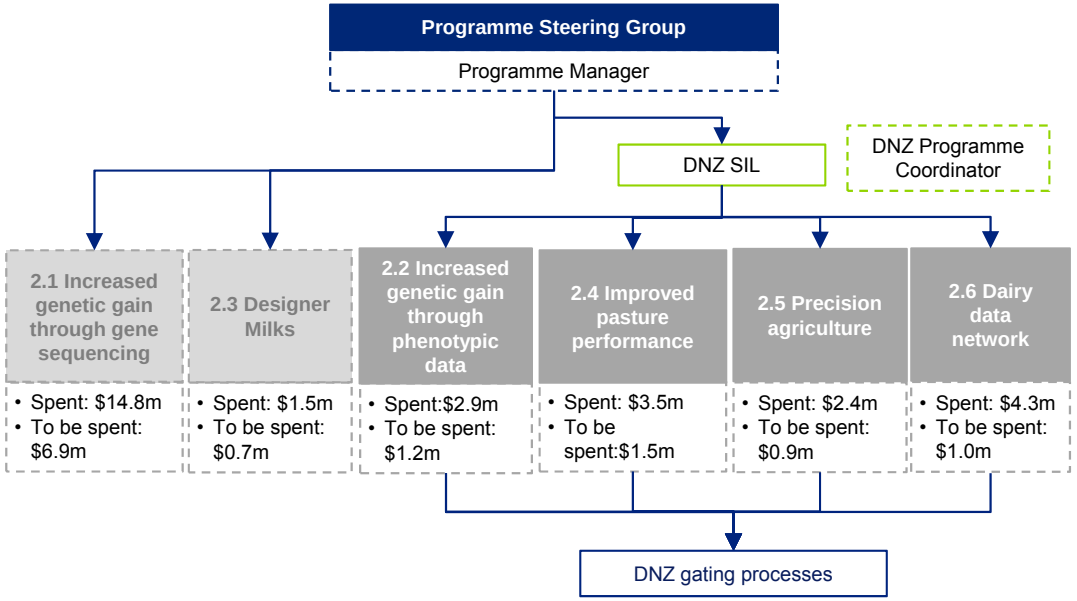
- Feb 2015: Independent review of Objective 2.4.

Theme 1 Summary Analysis: Management Processes

- There is no overarching leader for Theme 1. The appropriate DNZ SIL assumes overall responsibility for Objectives 2.2, 2.4, 2.5 and 2.6, with the support of Business Managers and the CFO. Each Objective has a designated project leader to co-ordinate activity. There may be an additional layer of management for Objectives that have a large and / or varied programme of work (such as Objectives 2.5 and 2.6), and where third party providers are engaged. These projects utilise standard DNZ reporting and management processes as well as Programme specific management responsibilities (such as quarterly and annual reporting).
- For Objectives 2.1 and 2.3, which have been sub-contracted to LIC and Synlait, respectively, projects largely operate autonomously with limited day-to-day management provided by DNZ. However, there is communication between the respective project leaders and the Programme Manager (previously DNZ Policy Manager), and DNZ is notified of any issues and outcomes of concern.
- There are two different approaches for gating projects under Theme 1 with DNZ projects relating to industry good and other projects relating to commercial imperatives. For DNZ Objectives, new projects are initiated in response to an identified industry need and / or farmer demand. All projects must go through an initial business case evaluation and gating process within DNZ. If the project passes through the gating process, the project will be fully scoped in collaboration with the provider(s), and subject to DNZ approval, will be submitted to the PSG.
- The way in which projects are transferred out of the Programme is dependent upon the intended future state, such as if it is industry good, or has commercialisation potential. DNZ, LIC and Synlait have proven channels with which projects have been transferred to industry, including Programme projects.

Theme 1 Management Structure



- DNZ Theme 1 Objectives utilise existing DNZ review processes, which comprises a mix of internal and external reviewers. These are formally documented and tend to be customised for each project. These are well-understood by the SIL. For example, independent advice from the NZAEL Science Advisory Committee (SAC) to guide the research activity and investment relating to Objective 2.2. Specific project external reviews are through an agreed process with the provider (and contract external reviewer).
- Objective 2.1 relies upon a pre-existing organisational group to provide expert advice and to review activity. Objective 2.3 has used independent expert advice in the past, but has no current expert panel in place.

Theme 1 Summary Analysis: Current State Analysis

- Our assessment included structured interviews with the SIL for Theme 1 DNZ Objectives, along with key personnel from major areas of activity and investment for the Theme.

Objective 2.1 Increased Genetic Gain through Gene Sequencing (LIC)

- This Objective uses gene sequencing technologies to improve the accuracy of predicting cow genomic BV. Investment has been focused on developing a large, world-leading data set in bovine genetics, and improved prediction models, enabled by the development of informatics capability (infrastructure and human resources). LIC has been sub-contracted by DNZ to undertake Objective 2.1. This programme of work is embedded into the broader LIC biotechnology programme.
- Key achievements include the discovery of a number (13) of genetic variations linked to dairy cow productive traits, sequencing work close to or at completion, and development of imputation tools to improve the rate and accuracy of determining genotypic and phenotype correlations.
- VLB, a subsidiary of Fonterra, originally partnered with LIC when the Programme was initiated. Following a change in its strategic focus in 2012, VLB withdrew from the Programme. As a result, LIC agreed to lead and fully fund the remaining industry co-investment. This led to a greater focus being placed on accelerating sequencing and analysis of variations attributed to particular traits of interest, including the addition of the New Zealand Bovine Genomic Reference, and subsequent termination of differentiated milk product milestones.
- Other changes have been made to sub-project milestones (2.1.1, 2.1.2, 2.1.3 and 2.1.5) as a result of research outcomes and guidance from the LIC SAB. Additional milestones may be added to the 2015/16 Annual Plan, as possible gaps in the sequencing data will need to be plugged or the data set expanded to increase the discovery power.
- The initial stages of the project focused on building capabilities, analysis pipelines and data generation and has subsequently transitioned into data mining and trouble shooting. LIC will continue to develop methodologies to allow the integration of sequence data into genomic evaluation methodologies and plans to create a 'New Zealand Bovine Genome Reference'. Selective and targeted data discovery will also continue in the short term, with the focus gradually shifting more towards deployment of discoveries and methodologies to industry.
- Despite the high level of technical difficulty of the sub-projects, the Objective is delivering strongly to its milestones (noting one minor delay to improve the value of outputs for 2.1.6), and integration into BAU is approximately 50% complete. Uptake has already commenced with integration of research findings into bull selection processes through the sire proving scheme, and Premier sire teams by screening for identified causative gene variations. In the case of causative gene variations with negative impacts, these have been offered to and taken up by local competitor breeding companies for consideration in breeding decisions. LIC are working with an international commercial entity to assess relevance and potential business models for international uptake.
- While there is a risk that the research does not find that sequence resolution improves the accuracy of genomic prediction, early indications suggest there is an 80% chance of that the project will be of value.
- Certain spillover benefits have also been identified. It is also likely that findings may be relevant for human health in the diagnosis of rare genetic disorders. For example, bioinformatics approaches developed in the Programme have been successfully deployed through a collaboration between Auckland University and Starship Children's Health to discover causative genes responsible for rare illness. The resourcing and scale of sequencing being undertaken is such that it is probable that it would not have been achieved without the Programme investment.

Theme 1 Summary Analysis: Current State Analysis

Objective 2.4 Improved Pasture Performance

- This Objective seeks to develop fundamental knowledge on ryegrass pasture persistence, considering both genotypic and phenotypic structures, to support pasture renewal and management practices on-farm and plant breeding programmes. This project responds to low farmer confidence in pasture renewal from observed poor persistency of new cultivar.
- The Objective is managed from within DNZ and has been mainly sub-contracted to AgResearch.
- The critical first step was to develop methods for assessing pasture persistency. Once validated and approved by the PSG, the project proceeded with the core persistency experiments, designed around three interrelated sub-projects, being the characterisation of ryegrass survivor populations in pastures on dairy farms ("Farm Survey"), pasture persistence field experiment ("Long Term Experiment") and phenotypic and genotypic analysis of survivor populations. These sub-projects range from moderate to high scientific and technical difficulty, made more complex by the large scale of the project (frequency and intensity trade-off).
- The key finding from the research so far is that the genetic composition and integrity of new ryegrass cultivar are comparable to older varieties, indicating a need for improved pasture management practices. An unintended consequence (spillover benefit) of this research has been the identification and isolation of an elite population of survivor plants for potential inclusion in future breeding programmes. Findings around the survivor cultivar have been communicated to plant breeders for use in plant breeding programmes.
- There has been no material change in this Objective to date. Two additional milestones have been added to reflect the phenotypic and genotypic work being undertaken at the sub-project level activity. A key challenge of this project has been managing the sheer scale of the work programme resulting from the large number of plant species that have been analysed from the Long Term Experiment and Farmer Survey.
- The next major step in this Objective is to identify indicator traits of long-term pasture persistence through continued phenotypic and genotypic analysis on the Long Term Experiment and, to a lesser extent, Farm Survey. Controlled experiments on the elite survivor plant population will support this work. This project is currently being scoped. Completion of this work will be an important step towards informing how persistency can be included in the Forage Value Index, which is a tool being developed to assist farmers to select cultivar that best meets their requirements. It is also likely that research findings may be relevant to other pasture based sectors (in addition to dairy) in New Zealand.
- The project is meeting contracted milestones. While there is a risk that it may not be possible to identify indicator traits of pasture persistence that are of practical value to dairy farmers within the remaining timeframe of the project, there is a reasonably high degree of confidence that successful outcomes will be achieved.
- A full independent international expert review has recently been completed (February 2015). The review was complimentary of the comprehensiveness of the research and its contribution to pasture persistency knowledge globally. The report concluded with a number of recommendations to guide the development of the future work programme. Assuming these are effectively implemented, the Partners should have confidence around this Objective for the remainder of the Contract.

Theme 1 Summary Analysis: Current State Analysis

Objective 2.6 Dairy Data Network

- This Objective seeks to consolidate a Dairy Industry Database Network with infrastructure and sharing capability. The expected output at the conclusion of the Programme is a functioning Dairy Industry Data Network, increasing accessibility to existing and new information. Findings from this work are likely to be relevant to other industries outside of the dairy sector, as evident by the Red Meat Profit Partnership's (RMPP) involvement.
- There are three Providers involved in the delivery of this Objective, being DNZ, Rezare Systems Limited and Scarlatti Limited. Various other parties have been sub-contracted by the Providers.
- The Objective is structured into three workstreams, being:
  - 2.6/1 Transition of the Core Database to transition the database to industry good stewardship for enhanced data to the benefit of industry.
  - 2.6/2 Revised Core Dairy Database to implement revised Herd Testing Standards with protocols allowing herd testing for Distributed Milk Systems and in-line and automated metering devices; and
  - 2.6/3 Integration of Other Data Sources aims to ensure the Dairy Data Network is an integrated set of industry, government and commercial databases. The two focus areas are to improve delivery and functionality of specific industry data network of database components, and to improve virtual data connectivity.
- A key success for the Objective was the transfer of the Dairy Core Database to industry good stewardship, signalling the completion of 2.6/1 and transfer of the project out of the Programme and into the capital build phase. The database transition to DNZ was enabled by a Formal Agreement between DNZ, NZAEL and LIC in August 2013, approximately one year behind plan. Programme funding was used to complete the business case and support industry consultation, government engagement and operational management required for this to take place.
- For 2.6/2, good progress has been made in relation to the development of revised (draft) New Zealand Herd Test Standards that enable additional herd testing protocols from Distributed Milking Systems (DMS) and Permanently Installed Milking Equipment (PIME). A lengthy acceptance process for Herd Test Standards (multiple parties involvement) has delayed farmers' ability to use DMS to receive BVs for their herds.
- Several sub-projects underpinning 2.6/3 have been successfully completed, including validation of the updated Fertility Focus Report, development of the Pasture Growth Forecaster (co-funded by Beef + Lamb NZ and since transferred to industry), and launch of the Farm Data Code of Practice. The formation of Farm Data Accreditation Limited has taken longer than anticipated, meaning organisations are not yet able to gain accreditation, which could delay the achievement of uptake targets. The latest PSG meeting approved the Design and Analysis stage of Data Linker (with the exception of the governance structure).
- The major next steps in this Objective are focused on embedding the Code of Practice into industry and continued development of Data Standards. The most significant risk facing the sustainability of the work is that industry and stakeholders do not continue investing in the Dairy Data Network beyond the Programme life. Case studies are being developed to estimate benefits to accrue to farmers and industry. While several projects underpinning this Objective are behind target, overall progress towards the contracted outputs remain on target.
- The Objective has demonstrated a high degree of responsiveness to realities that emerged over the course of the Programme (e.g. Data Linker). This work programme has resulted in more effective and faster collaboration and cooperation in establishing standards and protocols for sharing and in networking across databases in the dairy and other primary industries (evident by RMPP involvement). It may have helped stimulate the potential commercial services stemming from improved information matching in relation to forecasting.

Theme 1 Summary Analysis: Current State Analysis

Other Objectives

Objective 2.2 Increased Genetic Gain Through Improved Phenotypic Data

- This Objective aims to use phenotypic data to increase genetic gain in dairy herds through improved accuracy of estimating cow BV. This is to be achieved by building new phenotypes focused on animal health traits in to the Dairy Core Database in the three areas of fertility, lameness and facial eczema (FE), as advised by an external advisory panel. This project builds upon previous research carried out with sheep and dairy cattle.
- The Objective is managed from within DNZ. Lincoln University, CRV-Ambreed, AgResearch, and AbacusBio have been sub-contracted to assist in the delivery of the contracted outputs. LIC has also provided data.
- The major achievements from this milestone so far are FE-tolerant sires being made available to farmers through CRV-AmBreed NZ; experimental analysis indicating that incorporating alternative measures could increase the accuracy of the Fertility BV estimation (since validated by the NZAEL SAC), and identification of three potential new traits of economic importance for farmers, guided by advice from the NZAEL SAC. This latter achievement followed from the inclusion of an additional milestone in the 2013/14 Annual Plan to identify and potentially build new traits or phenotypes into the BW calculation (New Traits or Phenotypes) was included.
- Until recently, this Objective had a strong record of delivery of technical outputs on time or ahead of schedule, such as in relation to work carried out for FE. Additional research requested by NZAEL SAC into fertility has delayed delivery of the Fertility BV, and research and industry feedback indicates significant challenges for generating a lameness BV. As such, this Objective is currently facing the greatest challenge to achieve its contracted outputs. The major next steps are currently being prioritised and are dependent on research findings and feedback provided by NZAEL SAC. For instance, at least one candidate for a new BV that could increase genetic gain is to be presented to the PSG in May 2015.

Objective 2.3 Designer Milks

- This Objective seeks to develop farm management techniques to provide Designer Milks for production of speciality dairy-derived products. The integrated farm to factory structure of Synlait makes it possible to easily encompass both Pre- and Post-Farm Gate research activity under this milestone.
- Synlait has been sub-contracted by DNZ for this Objective. Synlait are supported by other contractors, including Otago University, Lincoln University and Auckland University. Realisation of benefits requires additional funds to be invested by Synlait for clinical trials and factory infrastructure.
- To date, key achievements include the first pilot scale and launch of a product (Sleepiz) into a test market, and the identification of a number of potential high value dairy extracts for further development.
- Key changes include the termination of Healthy Milk Herd Development (2.3.3) as preliminary findings and business case indicated that it was not commercially viable for Synlait to proceed. Funding was subsequently redirected to accelerate melatonin work (2.3.2) and a new High Value Milk / Colostrum Extracts project (2.3.4). Research findings during the early stages of the project, collaboration with Otago University and challenges identified to meeting market requirements also prompted modifications to the methodologies and work programme.
- Good progress has been made on this Objective, and the project is currently on-track in its delivery against contracted outputs and use of funds. Activity is to continue as planned against contracted milestones.

Theme 1 Summary Analysis: Current State Analysis

Objective 2.5 Precision Agriculture

- Precision Agriculture seeks to build knowledge and expertise on precision technologies that monitor animal performance and assess relative paddock performance to inform the development and adoption of advanced tools that optimise resource use and farm productivity. The project is managed by DNZ, and is supported by sub-contractors where required.
- This Objective has evolved in response to the rapid proliferation of marketed on-farm automation technologies: from ongoing consumer type testing of automation technologies available on-farm, to establishing protocols for industry use. Research into N fertiliser use was terminated after DNZ became aware of similar research being undertaken into nutrient use efficiency by other research organisations. DNZ continues to monitor progress of these research programmes. The project also increased its focus on feeding and nutrition applications in response to guidance provided by the FSG.
- Activity to date has focused on the delivery of science outputs relating to technologies monitoring animal performance and relative paddock performance, developed in collaboration with OEM providers and representative farmers. Industry stakeholders and farmers have been provided with this information through extension resources and events. For example, protocols for field evaluation of Automated Mastitis Detection Systems were released in May 2013. In the next phase of work, focus will shift towards the value application of precision feeding technologies in a farming system.
- According to the quarterly report as at 31 December 2014, progress towards contracted outputs and milestones, and use of funds are on track. The most significant risk is low industry uptake, from technology providers, RPs and farmers, which is critical to ensure the expected benefits are realised.
- This risk has been minimised through DNZ collaborating with leading farmers and working alongside technology providers to develop resources and guide the direction of the component projects. Inclusion of this work-stream within the Programme has brought forward the establishment of measurement and testing protocols and their use across precision agriculture, and the potential use by consultants advising dairy farmers in appropriate investment.

Theme 1 Summary Analysis: Expert Reviewer Assessment

Overview of activity

- The four research focused Objectives in Theme 1 have very disparate areas of focus as well as having different organisational drivers for Objectives 2.1 and 2.3 from those in Objectives 2.2 and 2.4. There is no common approach to gating of research but, because the reporting framework is consistent, milestone achievements are monitored robustly. Objectives 2.5 and 2.6 are more applied and are about working with industry to develop protocols and processes in assessing precision agriculture equipment and in sharing database information respectively.
- Recognising that all such projects have the usual component of technical risk around achieving expected outputs, they are generally on track to deliver their technical and protocol objectives successfully by the end of the Partnership. Notwithstanding, while Objective 2.2 has successfully delivered on research milestones, the way in which these translate into usable outputs and outcomes for certain projects is not clear. Objective 2.6 has pulled back from the original fully integrated database to one of a networked approach in one subproject.

Advisory processes

- The four science Objectives have developed different approaches to obtaining independent expert advice. Objectives 2.1, 2.2, and 2.4 are reliant on pre-existing organisational or national oversight groups with no specific focus on the Programme activity within the overall portfolio. Specifically:
  - Objective 2.4 has just had a targeted, independent, international panel review its progress.
  - Objective 2.3 has used independent expert advice in the past but has no current expert panel and no plans to obtain such advice for the next period of the Programme.
  - Objective 2.5 has a farmer steering group and equipment manufacturers group to guide the project.
  - Objective 2.6 has an industry steering committee made of the key stakeholders holding databases.
- With the exception of Objectives 2.1 (SAB) and 2.2 (NZAEL) none of the various individual expert advisory groups have a strong role in scoping, developing and recommending approval of specific projects for inclusion in the Programme. Trait selection for activity within Objective 2.2 is through advice from their external advisory panel. Objectives 2.5 and 2.6 have been positively influenced by their steering and advisory groups in terms of direction and adapting to emerging issues.
- Objectives 2.1 and 2.4 are both long-term research programmes which should not require significant change in direction during the remaining life of the Programme. Any recommendations from independent reviews would be expected to be refinements of approach rather than new directions necessitating new project development. Objective 2.3 has made significant shifts in its project portfolio since inception and did this on the basis of independent advice as well as consideration of company priorities. No further changes are planned.

Conclusions

- Theme 1 objectives 2.1 and 2.3 are subcontracted to Synlait and LIC and are not overseen by the DNZ SILs but are managed via the DNZ Programme Coordinator through to the PSG and MPI. The Chief Executive of DNZ saw the PSG as the oversight group for LIC and Synlait delivery. While there are no current issues, this limited level of oversight by the contract holder for such a large sub-contract is not appropriate. The DNZ SIL has overall responsibility of the remaining Objectives and manages this either directly or through steering committees and advisors.

Theme 1 Summary Analysis: Expert Reviewer Assessment

Conclusion (continued)

- Overall, there is blurring of accountabilities in terms of the Theme 1 research objective performance. It will be difficult for the new Programme Manager, as a Fonterra employee, to implement more robust lines of accountability even with the proposed changes to the Contract.
- Because of the very different focuses of research activity there is no interaction of projects across the science activities of this Theme. However, again because of the very different areas of focus, it is not apparent that this lack of interaction has resulted in lost opportunities for accelerating successful delivery.
- Of the science activity in Theme 1, Objective 2.2 is currently the most at risk of not meeting its 2018 targets. There is currently some delay in the delivery of the enhanced Fertility BV, and the work on lameness has been assessed as having significant challenges in delivery. The FE work has been commercialised and is awaiting feedback from NZAEL as to whether any more work needs to be done.
- Objective 2.5 is on track to deliver standards and protocols for precision agriculture with the application being dependent on the ownership by the equipment manufacturers and RPs who advise dairy farmers.
- Objective 2.6 is on track to deliver improved networking protocols and processes and improved applications to support farm decision making. It will require farmers understanding the opportunity and potential benefits.

Theme 1 Summary Analysis: Overall Theme Assessment

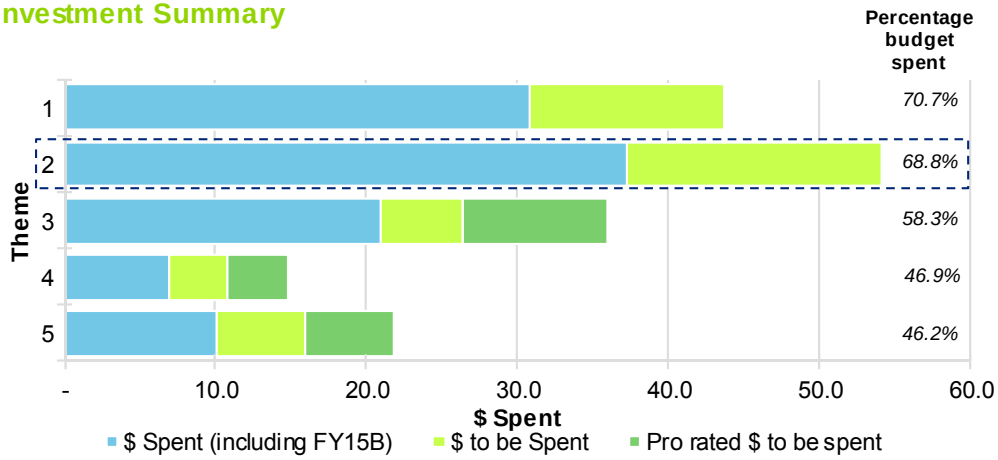
Area	Commentary	Assessment
Progress to date	• We believe that progress to date in this Theme is on track. Theme 1 has spent 71% of its total budget halfway through the Programme, which is line with expectations and indicates that the proposed activities will be completed within the contracted period. In saying this we note that Objective 2.1 represents 50% of the investment and is making good progress. • Some projects have been successfully completed and moved into industry (FE tolerant bulls, Pasture Growth Forecaster and the updated Fertility Focus Reports). That said, some of the remaining activities to be completed include industry adoption, farmer uptake and ongoing industry support and we have noted these may be a challenge. • Some milestones and projects have been terminated based on changes in the strength of the supporting business case. These projects appear to have been terminated in a timely manner.	
Likelihood	• Theme 1 Objectives are delivered through a collection of six projects and a range of sub-projects, and because the benefits have not been attributed to the six projects it is not possible at this time to determine if the investments made in these projects will deliver the expected benefits individually or in aggregate. • That said, we have not identified any reasons why the contracted outcomes will not be delivered. Therefore there is a good likelihood of achieving contracted outcomes if the progress made to date is maintained.	
Key risks and challenges	• While this Theme does contain a number of risks and challenges, we believe that these are being managed well and will largely be mitigated or overcome. Objectives 2.1 and 2.2 are, as examples, technically challenging but are supported through peer reviews and other technical assistance as required. • The remaining activities in the Theme are the more challenging aspects and 29% of the budgeted funds remains. In discussion with the project leaders, there is no material concerns regarding the financial resources left to complete their projects. • While there is an outcome logic framework with a large number of draft indications and measures against which progress is measured, there is no benefits realisation framework and therefore a process to monitor the realisation of benefits against progress. As a result, the opportunity to review and refresh the current performance indicators to include indicators that reflect the direct influence of programs on the change process hasnot yet eventuated.	
Overall conclusion	• Overall this Theme is progressing to plan and is well-placed to deliver significant outcomes. • For the smaller Pre-Farm Gate projects, however, the more challenging and, by definition, the more risky aspects of delivering the Theme's benefits are to come (e.g. farmer support). 29% of the budget is available to deliver the Objectives and transition into BAU, with the majority of it to be spent in the years ending June 2016 and 2017. • The appointment of the project manager to support and lead the Themes through the coming transition from the Programme into the BAU environment will increase the likelihood of realising the anticipated benefits.	

Theme 2 Summary Analysis: Overview

Introduction

- Theme 2 is about increasing the capability and capacity of the dairy industry to enhance farmer decision making, and therefore on-farm productivity. Programme investment aims to maintain industry competitiveness by building industry capability, upskilling RPs, developing and supporting networking, and attracting more people to industry.
- The analysis opposite shows total Theme 2 investment relative to other Themes over the life of the Programme. Theme 2 represents the largest area of investment for the Programme. For presentational consistency of this illustrative analysis we have prorated Pre-Farm Gate administration costs across the corresponding Themes (50/50). This analysis shows that Theme 2 investment is around $54.2 million or 55% of Pre-Farm Gate investment and 32% of overall Programme investment.
- By the end of this funding year FY15B, around $37.3 million will be spent, and a further $16.9 million will be spent by the end of the Programme. This implies that Theme 2 is around 69% through its investment.
- Theme 2 is managed by two DNZ SILs. There are a number of disparate projects comprising the Theme. DNZ has sub-contracted providers and collaborated with a range of organisations and industry stakeholders to assist in the delivery of component projects, leverage existing networks and expertise, and stimulate industry uptake.
- Many of the projects are addressing change imperatives that are driven by forces outside of the immediate on-farm needs – for example, environmental and welfare matters. Farmer demand is critical to having initiatives impacting on the industry and so the importance of taking farmers along with the project, creating awareness, understanding, interest and take-up of opportunities is a key consideration for these projects.

Investment Summary



Source: Business Plan FY2015, DNZ, Fonterra
Pre-Farm Gate administration costs have been prorated against its corresponding Themes, as has Post-Farm Gate administration costs and unscoped investment / unallocated funding.

Theme 2 Summary Analysis: Overview

Objectives

- The table opposite summarises the investment to date and the further planned investment by Objective as at June 2014. This analysis has been adjusted for a share of the Pre-Farm Gate administration costs. Specifically the Objectives related to Theme 2 are as follows:
  - 2.7. Whole Farm Assessments and Plans. Work with advisory and training organisations to define minimum knowledge requirements and best practice, and supporting its development and implementation; and
  - 2.8. Increased Capability and Competency. Enlarge infrastructure for dairy farm businesses to support, retain and grow talent in the sector. Develop platforms to directly support farmer wellness and wellbeing.
- The analysis opposite highlights Objective 2.7 as the major area of activity and investment in this Theme, representing total Programme investment of $32.4 million or 60% of total Theme 2 investment.

Objective Level Investment Analysis

$m	Act PTD	Budget FY15	Budget PTG	Total
Theme 2: Capability and Capacity				
1.1 Programme Management*	1.1	0.3	0.6	2.0
2.7 Whole Farm Assessment				
2.7/1 Nutrient Management and 2.7/2 Effluent Management	10.4	1.8	4.0	16.2
2.7/3 Greenhouse Gas Management	0.2	0.2	0.4	0.8
2.7/4 Animal Welfare Management	4.8	1.6	3.5	9.9
2.7/5 System Integration and Risk Assessment and People Management	2.6	0.6	1.3	4.5
2.7/6 Herd Reproduction Management	-	0.3	0.7	1.0
Sub-total	**18.0**	**4.6**	**9.9**	**32.4**
2.8 Capability and Competency				
2.8/1 Leadership Pipeline	2.9	0.8	1.7	5.4
2.8/2 Professional Land Managers	0.5	0.4	0.4	1.3
2.8/3 CEFBM	3.1	0.8	1.7	5.6
2.8/4 Large Farm Businesses	1.3	0.5	1.2	3.0
2.8/5 Farmer Wellness and Wellbeing	1.7	0.4	1.0	3.1
2.8/6 Smaller Herd Farm Businesses	0.7	0.2	0.4	1.3
Sub-total	**10.2**	**3.1**	**6.4**	**19.7**
Total	**29.2**	**8.0**	**16.9**	**54.1**

Source: Business Plan FY2015, DNZ

*Total Pre-Farm Gate programme management costs have been prorated on a 50/50 basis between Themes 1and 2.

Theme 2 Summary Analysis: Overview

Objective 2.7 Whole Farm Assessments and Plans

- This Objective aims to upskill Rural Professionals (RPs) in emerging areas of need with the end goal of improving technical solutions and farm management advice for farmers. This responds to strategic industry needs to increase on-farm resource use efficiency and manage reputational risks for New Zealand.
- Unlike the traditional DNZ model of interacting with farmers on a one-to-many basis (i.e. discussion groups), the approach taken for this Objective has been for DNZ to directly collaborate with RPs to develop capability in the identified areas of need. Engaging directly with RPs has enabled greater and more effective farmer reach as a result of the direct one-to-one approach to engagement between RPs and farmers.
- The Objective is comprised of six components that are each made up of modules to develop and implement programmes (some include formal certification of individuals or accreditation of companies) that address identified needs, and to encourage a farming systems focus of RP service delivery. These six components are:
  - 2.7/1 Nutrient Management. Develop training and quality assurance systems and support structures to meet farmer demand for independent and quality-assured advice on nutrient management planning.
  - 2.7/2 Effluent Management. Reduce rates of significant non-compliance by increasing the skill level of the effluent service industry, increasing on-farm awareness and knowledge for effective effluent management, and engaging with regional councils and milk companies.
  - 2.7/3 Greenhouse Gas (GHG) Management. Provide knowledge and tools required for developing a network of certified GHG consultants for the dairy industry, and a framework for rewarding farmers for any GHG reductions made.
  - 2.7/4 Animal Welfare and Off-Paddock Management. Develop advisory and training capability in animal husbandry and management.
  - 2.7/5 System Integration and Risk Assessment and People Management. This overarching project will connect all facets of the dairy farm system, including people.
  - 2.7/6 Herd Reproduction Management. Transform Herd Reproduction Management in the dairy industry.
- The most significant area of investment relates to the Nutrient Management and Effluent Management projects, with a total investment of $16.2 million or 50% of total Objective 2.7 investment.

Theme 2 Summary Analysis: Overview

Objective 2.8 Increased Capability and Capacity

- Two platforms of work are being developed as part of this Objective:
  - Enlarging infrastructure supporting dairy farm businesses by investing in mechanisms to lift performance of both farm owners and managers, and RPs;
  - Providing direct support to farmers by extending knowledge and improvement practices around farmer wellness and wellbeing.
- There are six areas of activity that underpin this Objective:
  - 2.8/1 Leadership Pipeline. Provide integrated career development pathways to build technical, business and people management capability;
  - 2.8/2 Professional Land Managers. Provide a pathway for continuous professional development for farmers;
  - 2.8/3 Centre of Excellence in Farm Business Management (CEFBM). Build linkages between academics, RPs and farmers to grow Farm Business management capability, through industry-driven research, education and connectivity programmes;
  - 2.8/4 Large Farm Business. Deliver to the specific needs of multiple farm owners, and their farm supervisors, mandagers and advisors;
  - 2.8/5 Farmer Wellness and Wellbeing. A change management strategy targeted to change behaviours and attitudes of dairy farmers (and families) to improve and maintain personal and social wellbeing; and
  - 2.8/6 Small Herd Farm Businesses. Provide a sense of identity and purpose to smaller dairy herd farmers.
- The two major areas of activity, being the Leadership Pipeline and CEFBM, have total funding allocations of $5.4 million and $5.6 million, respectively. Together these account for 56% of total Objective 2.8 investment.

Theme 2 Summary Analysis: Timeline

Theme Development

- Theme 2 Objectives are delivered through a collection of 12 capability and development projects that are primarily managed independently of each other. Given the diversity of the projects and the number of reported achievements it is not practical to list them all. Therefore the following is a brief summary of the key events and influencing factors in the development of Theme 2. The chart opposite also highlights some of these events.
- To date, a number of positive results have been achieved. Training, accreditation and certification programmes, and other supporting resources have been launched in key areas of emerging need, including the Code of Practice for Nutrient Management (original and version 2), Farm Dairy Effluent System (FDES) Accreditation, and Body Condition Scoring (BCS) Assessor Certification. Primary Industries Capability Alliance (PICA) has been established, as has the CEFBM, and engagement with large and small farm owners has been encouraging to date. Rural Business Network (RBN) hubs continue to strengthen and grow in numbers, and good results have begun to emerge in relation to developing early stage awareness of career opportunities in primary and secondary school students.
- A number of internal and external reviews have taken place since the Programme commenced in 2011, which have shaped the work programme of the Objectives, and project selection. New projects have been initiated, such as the Off-Paddock Herd Homes (2013/14 Annual Plan), and the InCalf project was transferred from Theme 1 (Objective 2.6) as it is more aligned with Theme 2 (2014/15 Annual Plan).
- In 2014, reviews of Professional Land Managers (PLM) and Farmer Wellness and Wellbeing prompted significant changes to be made to these workstreams. Revised project plans for both initiatives have been developed and subsequently approved by the PSG. The launch of My Achievements and Career Opportunities (MACO) has been put on hold due to usability and functionality concerns.

Timeline of Key Events

2011

- Feb 2011: Programme commenced.
- Mar 2011: CEFBM launched
- Dec 2011: Farm Dairy Effluent System Design Accreditation implemented
- Code of Practice for Nutrient Management.
- Rural Mentoring Programme established.
- AgriKids launched. TeenAg incorporated into Programme.

2012

- May 2012: Rural Business Network established
- Nov 2012: Audited Nutrient Management System implemented
- Dec 2012: Upskilling Farmer Trainers Animal Welfare Management Programme operational

2013

- Feb 2013: Body Condition Score Assessor Certification Programme operational, including training (established 2012)
- Apr 2013: Certified Nutrient Management Advisors operational
- Jun 2013: Two Dairy Farm Systems decision support tools developed
- Pastoral sector mental health workshops for supporting networks
- Delivery of Mark & Measure Farm Business Governance Programme courses commences
- Review of Rural Mentoring Programme

2014

- Mar 2014: Code of Practice for Nutrient Management, Version 2 issued
- May 2014: Effluent System Warrant of Fitness operational
- Jul 2014: PICA established as independent self-supporting entity
- Aug 2014: People Management Consultants Certification programme operational
- Sept 2014: Review of PLM leading to new strategy being implemented
- Sept 2014: Review of Farmer Wellness and Wellbeing Programme leading to new strategy being implemented

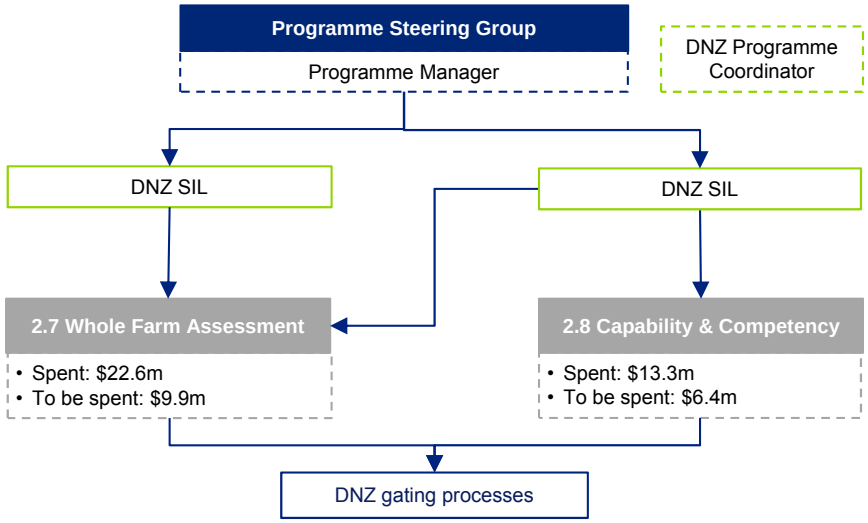
2015

- Jan 2015: Review of CEFBM

Theme 2 Summary Analysis: Management Processes

- Similar to Theme 1, there is no single overarching leader for Theme 2. Two DNZ SILs jointly assume responsibility for Objective 2.7, while one DNZ SIL manages Objective 2.8.
- Rather than having one person responsible for leading each Objective (as per Theme 1), there are a number of people who report to the SILs in each of the major areas of investment, limiting the natural ability to share and collaborate across the projects. This reflects the large and disparate nature of the Objectives captured in this Theme. Where external party providers are engaged, an additional layer of management exists.
- All projects utilise standard quarterly and annual DNZ reporting and management processes, as well as specific Programme management responsibilities (such as quarterly and annual reporting). For instance, DNZ has three-monthly meetings with 'Train the Trainer' project leaders to assist with integration and direction. This has appeared to help collaboration and integration and dealing with common issues.
- Projects have generally been identified by DNZ and industry organisations (appropriately), rather than the dairy farmer population. Taking farmers along with the project is therefore a key consideration for these projects. For DNZ Objectives, new projects are initiated in response to an identified industry need and / or farmer demand. All projects must go through an initial business case evaluation and gating process within DNZ. If the project passes through the gating process, the project will be fully scoped in collaboration with the provider(s), and subject to DNZ approval, will be submitted to the PSG. If approved by the PSG, the project becomes active.
- The way in which projects are transferred out of the Programme is dependent upon the intended future state, such as if it is industry good, or has commercialisation potential. DNZ has proven channels with which projects have been transferred to industry, including projects within the Programme.

Theme 2 Management Structure



- Pre-existing DNZ review processes are used for Theme 2 projects. These are formally documented and tend to be customised for each project. These are well-understood by the SILs.
- Specific project external reviews are through an agreed process with the provider, and often arises from the need to address issues and for guiding forward direction. Two recent instances of where external reviews have occurred include the PLM and Farmer Wellness and Wellbeing programmes, both of which resulted in significant changes being made to the future work programme.

Theme 2 Summary Analysis: Current State Analysis

- Our assessment included structured interviews with Theme 2 DNZ SILs. We also interviewed personnel from key projects to provide greater insights into the major areas of activity for each Objective.

2.7/1 Nutrient Management

- There are three aspects to this project, which are described as follows:
  - Certified Nutrient Management Advisors (CNMA) programme is aimed at developing and implementing training, accreditation and monitoring systems. The Nutrient Management Advisory Certification Programme Limited oversees the implementation of this programme, which has been operational since November 2013. The target of having 50% of fertiliser companies with CNMA was achieved in June 2014.
  - The ANMS project is an industry-driven audit scheme to enable the tracking of farm progress towards agreed industry nutrient management targets. Under the Sustainable Dairying: Water Accord, all milk companies are required to supply information on nitrogen loss using the ANMS.
  - Regional Land Management Guides to be developed to assist RPs provide advice to farmers managing nutrient loss. Nine regional riparian guides have been developed to date.
- Programme investment in the project is nearing completion. The major area of activity to be carried out is to complete the development of the land management guides.
- Overall the project is on target. The most significant risk facing the project is poor industry uptake. While DNZ is experiencing lower than anticipated uptake (and therefore delaying benefits realisation), progress towards targets are tracking positively. DNZ has embarked on awareness and promotion activities to encourage use of certified consultants, in addition to the Otago and Southland councils now requiring CNMAs for consents, somewhat alleviating this risk.

2.7/2 Effluent Management

- This programme of work is made up of the following sub-projects:
  - Farm Dairy Effluent System (FDES) Design is an accreditation program based on accrediting companies for a two year period on demonstration of design competency in accordance with the current FDES Code of Practice and Standards, and adequate quality assurance processes. The accreditation system is operational (implemented in Dec 2011) and is administered by IrrigationNZ Limited.
  - Effluent System Warrant of Fitness programme, whereby certified individuals assess dairy farm effluent systems following a consistent methodology, was launched in 2014 and is administered by QCONZ.
  - Pond Design & Construction Training is targeted at contractors designing and constructing effluent ponds. The training programme is operational.
  - Farmers & RP effluent management awareness campaign is supported by technical and extension workshops and seminars delivered nationally.
- As at February 2015, 21 companies had FDES Design accreditation, and over 500 RPs had been trained in the effluent service industry. Over the next few years activity will be focused on delivering further extension to farmers and RPs, and working with key stakeholders, such as regional councils, to endorse the programme and encourage companies to apply. While the project is on target, it is at risk of not being able to achieve the contracted level of FDES accreditations, which is partly the consequence of consolidation occurring within the industry. It is facing lower than expected levels of industry uptake, particularly as there currently appears to be limited commercial advantage to drive accreditation applications (although companies are already using the outputs from this project). DNZ is confident that this will change in the near future as market awareness (e.g. through awareness campaigns) and regulatory demands increase over time. Therefore, while there may be a delay in expected gains being realised by industry, the overall impact on outcomes is expected to be low.

Theme 2 Summary Analysis: Current State Analysis

2.7/4 Animal Welfare and Off-Paddock Management

- The following sub-projects underpin this area of work:
  - The BCS programme aims to reduce animal welfare risk and increase cow reproductive performance through improved cow condition management. DNZ BCS reference standards have been established and are supported by a certification programme (established 2012). AsureQuality Limited provides credentials and tracks accreditation.
  - Upskilling farmer trainers, which seeks to train industry partners to deliver the material and incorporate into existing training programmes, or develop new channels. Trainings held to date include Cow Health and Condition, Lameness, and Calving Management.
  - Off Pasture Design and Management aims to define a competency framework for Herd Homes in New Zealand, where a hybrid system has been adopted. Other areas being scoped or are under development include a competency framework for design of off-paddock facilities and off-pasture minimum knowledge requirements.
- The next major area of activity for the programme is to embed the BCS programme into industry, as well as to continue to deliver farmer training and progress off-pasture design and management projects.
- Similar to other 'Train the Trainer' projects, the most significant risk to this programme is low industry uptake. There has been push-back from industry challenging the (burdensome) process to maintaining certification (half of certified assessors have lapsed), as well as from reluctance to change. Unlike the nutrient and effluent management programmes, which have some regulatory drivers, the BCS programmes relies on in-market consultants seeing value and commercial advantage in being better able to deal with issues important to dairy famers. Notwithstanding, the project is on track to deliver outputs in accordance with the contract.

Other Projects

- 2.7/3 GHG Management is comparatively less advanced than other focus areas due to a lack of a direct driver for on-farm change. Good progress continues to be made on this project to ensure systems are in place to respond to future drivers and which will benefit all pastoral sectors. Recent achievements include developing minimum knowledge and training requirements for GHG management, and a prototype farm-level risk assessment framework.
- 2.7/5 System Integration and Risk Management Assessment and People Management Project is playing a lead role in industry consultation and collaboration and responding to needs. The System Integration and Risk Management Assessment programme is a critical component of Objective 2.7 as it re-enforces the integrated whole farm system approach to improving dairy farm performance. It provides an overarching framework RPs can use to identify where gaps exist on-farm and how these can best be addressed. Over the last year, this project team has taken strong leadership in the certification, accreditation and integration process across the projects in this Theme, and this will continue in the coming year. As at February 2015, two RPs achieved People Management Consultants certification (launched August 2014), and 16 RPs were trained in Dairy Farm Systems decision support tools.
- 2.7/6 Herd Reproduction Management is comprised of two main projects, being the Heifer Rearing project and InCalf advisor training (transferred from Theme 1). Industry agreed work programmes for delivery of an improved heifer grazier service have been developed. The proposed certification process to building InCalf advisor capability is being reviewed as strong resistance from the Dairy Vet Strategy Group resulted in no uptake. However, the materials developed through the process are contributing directly to capability development, and will ensure outcomes will still be achieved (albeit with some delay).

Theme 2 Summary Analysis: Current State Analysis

2.8.1 Leadership Pipeline

- This work-stream is made up of several projects that provide and promote integrated career development opportunities for the dairy industry and other pastoral industries. NZYF has been sub-contracted by DNZ to lead this area of work.
- A major achievement to date has been the establishment of PICA (also supported by RMPP and other industry bodies, such as Beef + Lamb), which is a vehicle that brings together people, resources and ideas across the New Zealand pastoral sectors. PICA is now a standalone entity that has moved out of the Programme and into BAU. Growing youth engagement has been encouraging (e.g. AgriKids in 66 schools, reaching over 1,400 students as at September 2014; TeenAg has over 35 clubs with 690 members as at November 2014). Attendance at the RBN hubs has continued to grow (five hubs and over 400 members as at September 2014), as has interest in the developing Rural Mentors Programme (now aligned with the RBN following its review in 2013, and is partnering with Business Mentors New Zealand).
- An example of a project that has been problematic is the MACO toolkit, which has required additional funding and extensions in order to meet its original objectives. The launch of MACO has been postponed due to functionality concerns as the project platform has not kept pace with on-farm technology change. This may result in a lower rate of upskilling and retention of individuals in the sector, and therefore gains realised by industry. Alternative channels are currently being considered.
- The next major area of focus for this Objective is to implement and embed integrated and cohesive projects across industry in a way that ensures the initiatives and their effects endure beyond the Programme. This requires key industry stakeholders to collaborate and agree to a forward direction.

2.8.2 Professional Land Managers (PLM)

- The original premise for the PLM project was to develop a professional land managers network to provide the impetus and leadership mechanism for developing professionalism on-farm. ASL were engaged by DNZ to undertake this programme of work and have also contributed funding.
- After three years of implementation, DNZ and ASL identified the need to review progress to date and reassess future workplans, due to difficulty faced in implementing a value proposition for farmer participation. A mid-term review (March 2014) recommended a shift in focus to establishing a continuous learning framework to support farm managers attain excellence. While a PLM association could be the long-term solution to achieve the desired outcomes, there does not yet exist an appetite from industry for this platform.
- The next steps for the project are to be informed by discussions with the steering group and industry collaboration, and supported by recent research. A key challenge for the project going forward is being able to demonstrate the value proposition in continuing professional development for farmers. It is essential that there is collaboration, alignment and agreement on the future state of the professional development framework to ensure sustainability of benefits beyond the Programme.

Theme 2 Summary Analysis: Current State Analysis

2.8.3 Centre of Excellence in Farm Business Management (CEFBM)

- The CEFBM initiative is a joint venture between Massey and Lincoln Universities, operating under the Agri One Limited and Partnership for Excellence (PfX) frameworks, and delivered under OneFarm. The initiative aims to build research and capability in the area of Farm Business Management. The three focus areas for OneFarm are research, education and connectivity, which are supported by formal university certification (Research and Education Programme) and informal learning (Connectivity Programme), to provide a logical way to transition academic and in-market knowledge to the next generation.
- Good progress has been made as a number of research projects (20) and post-graduate courses have been developed and around 40 webinars have been hosted on the OneFarm website. A key area of focus for the project going forward is to increase awareness of OneFarm in the dairy industry to assist the adoption pathways and therefore benefits realisation.
- A key challenge for this project has been to create a culture of collaboration between two universities that typically compete with one another rather than co-operate. The project is continuing to gain traction at the universities as the benefits of earlier work to industry have begun to be realised. There has also been an increase in the level of collaboration among RPs as a result of the project.
- Project leads are now considering what actions could be taken to ensure the work-streams are viable, achieve desired industry outcomes and continue beyond the Programme, following an internal review commissioned by DNZ (Jan 2015) providing recommendations in relation to strategy, industry connections, research and governance. While the focus of OneFarm has been on the dairy sector, other pastoral sectors (e.g. red meat) will likely benefit and therefore work with OneFarm in the future.

Other Projects

- 2.8/4 The Large Farm Business project is engaging and delivering their programme through training (such as Mark & Measure Farm Business Governance Development courses which had been delivered to 21 businesses as at March 2014) and through farm supervisor discussion groups involving 300 large farms. They are also engaging with Maori owned farms with the support of the Federation of Maori Authorities. Follow up evaluation from the first round of training was positive.
- 2.8/5 An independent review of the Famer Wellness and Wellbeing Project was commissioned in 2014 to determine whether the multi-agency project was on track to deliver desired industry outcomes. This resulted in the project being brought back under direct DNZ management, raising questions as to the adequacy of interaction with the previous organisations who were managing the project – but could also indicate a positive example of making adjustments as needed to ensure the success of the project. The forward direction of the project has been designed and subsequently approved by the PSG. As part of this, Health Pitstops (at conferences and other farmer events) and mental health training is to continue and increase reach to farmers, and research and content (such as pastoral sector mental health workshops) supporting improved farmer health will be incorporated into industry programmes.
- 2.8/6 The Small Herd Farm Businesses project is led by the Small Milk and Supply Herds Trust (SMASH), which relies on regional groups to organise / support events, such as on farm field days to bring dairy farmers together as well as bringing together special interest groups. The annual funding for the SMASH project has exceeded spending across the different activities to a decreasing level over the years. The project is on track to delivering contracted outputs, and feedback from farmers has been positive (e.g. over 80% farmers have increased confidence in making on-farm changes). The investment has also supported the small farmer network to further develop and mature, and become a recognised platform for collaboration in the rural community.

Theme 2 Summary Analysis: Expert Reviewer Assessment

Overview of activity

- Objective 2.7 deals with skilling professional support staff in emerging needs. It has been driven by strategic needs and gaps identified in the industry. They deal with different industry bodies for development, certification and accreditation – with one project (System Integration and Risk Assessment and People Management) providing an integrating function. There is some limited interaction between the different accreditation programs. Accreditation, certification and other training programs are progressing well across this Objective. The model of delivery for Herd Reproduction Management has recently changed in response to value proposition to industry uptake.
- Objective 2.8 is directed at skilling dairy farmers and farm workers (although the CEFBM also provides training to professionals) through a number of projects which are largely independent. Although linking to some common sources of training (Primary ITO, CEFBM), the focus is on a more informal approach to encouraging participation in training, mentoring and discussion groups. Initial plans to more formalised capacity building approaches were modified following farmer feedback.

Advisory processes

- Most of the projects under Objective 2.7 have a high level of stakeholder involvement through relevant industry bodies owning accreditation / certification processes, and involvement of the universities and consulting firms in developing agreed competencies and resources or providing training. There has also been good evidence of industry input through focus groups and advisory groups in some projects. DNZ brings project leaders together on a three-monthly basis to assist in coordination and there has been other cross-project meetings, but there is no common platform for ongoing collaboration and learning.
- Objective 2.8 has strong industry involvement through specifically established Steering Groups, Advisory Committees or Trusts. DNZ is present on these groups and so has a direct influence, and the SILs involved are fully informed. Reviews were used with some projects that were seen as struggling and changes made as a result. A review of Farmer Wellness and Wellbeing saw it move from external management to direct DNZ management. A review of PLM saw a change from a planned formal Professional Land Managers Association to a more informal 'Continued Professional Development Structure'. There does not appear to be an oversight / coordinating platform across the projects directed at farmer capacity, although this could provide integrating benefits. It is expected that PICA will fulfil this role once fully established.

Conclusions

- Across both Objectives, there has been strong within-project interaction and guidance from industry generally and DNZ specifically. Both areas of skilling professionals (Objective 2.7) and skilling dairy farmers and workers (Objective 2.8) would benefit from having a common platform across their respective projects.
- The accreditation / certification process has been driven by strategic imperatives, but will require embedding in the organisational, regulatory and dairy farmer culture for it to have the sustainability and benefits realised. For this, a cross-discipline strategy of promoting the need and benefits of accreditation will be needed and directed towards: RPs; supporting agencies (banks, milk companies, regulators); and dairy farmers and managers.
- The farmer skilling initiatives all have merits and have different, but overlapping, foci. For these to be embedded and successful in providing skill pathways, further integration across these initiatives will be needed, including an effective communication and promotion strategy, skilling framework and a way of providing ongoing farmer feedback into needs.

Theme 2 Summary Analysis: Overall Theme Assessment

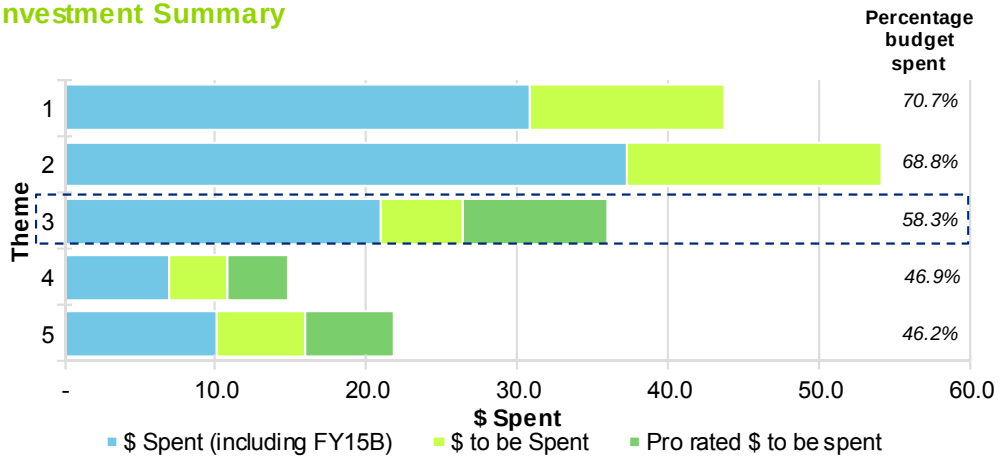
Area	Commentary	Assessment
Progress to Date	• In general, good progress has been made in the development of technical outputs (e.g. accreditation systems for farm dairy effluent systems and BCS). Some concern has been raised in relation to several projects (e.g. Farmer Wellness and Wellbeing, PLM), which has prompted revisions of the original work programmes. • Theme 2 has spent 69% (as at FY15B) of its total budget halfway through the Programme, which is line with expectations and indicates that the proposed activities will be completed within the contracted period. • That said, the remaining activities to be completed include industry adoption, farmer uptake and ongoing industry support.	
Likelihood	• Theme 2 Objectives are delivered through a collection of 12 capability and development projects that are primarily managed independently of each other. As the benefits have not been attributed to the 12 projects, it is not possible at this point in time to determine if the investments made in these projects will deliver the expected benefits individually, or in aggregate. • The projects are delivering to plan (e.g. industry documentation, accreditation systems etc.), however the projects are entering the phase of adoption, farmer uptake and transition to a BAU environment. These activities are the more challenging aspects and detailed plans to manage through these phases are being developed. This will therefore require a greater level of leadership, innovative thinking and a cross-discipline approach than we have observed to date to meet the Objectives set.	
Key Risks	• While most of these projects have a low level of technical difficulty, low demand from RPs, dairy farmer buy-in and ongoing industry support will hinder progress going forward. The remaining activities in the project are the more challenging aspects and 31% of the budget remain (as at FY15B). • It is critical that there is strong industry collaboration / buy-in to ensure projects will have a life beyond the Programme and that expected Programme benefits can be realised. Most of the activity in the projects to date has occurred independently of each other, particularly where third party providers have been engaged. DNZ has recently increased engagement with providers, which should increase opportunities for collaboration and shared learnings and minimise the risk of duplication of efforts.	
Conclusion	• Progress to date is largely meeting plan, however the more challenging and, by definition, more risky aspects of delivering benefits are to come. 31% of the budget is available to deliver the Objectives and transition into BAU, with the majority to be spent in the years ended 2016 and 2017. The BAU environment beyond the Programme is closing fast and a comprehensive and cross-disciplined strategy and transition plan (part of the annual plan) is required to continue to drive awareness, cultural change and the value proposition needed to embed and sustain the certification / accreditation processes into the advisory landscape of the dairy industry. • Performance indicators for the projects should be revisited to consider the direct influence of the projects outputs and activities on decision making and practice changes on-farm. We would expect to see these coming through in the 2015/2016 Annual Plan.	

Theme 3 Summary Analysis: Overview

Theme Overview

- Theme 3 is about food structure design, which is an emerging area of science that blends food science and food engineering with non-food material science. Programme investment in this area aims to deliver new ways to address the challenges of food design to enable the development and manufacture of complex foods and food ingredients required to meet growing consumer demand for healthier customised foods.
- The analysis opposite shows total Theme 3 investment relative to other Themes over the life of the Programme. This analysis is intended to be illustrative and for presentational consistency we have prorated Post-Farm Gate administration costs and unscoped investment across its corresponding Themes. This analysis shows Theme 3 total investment will be around $36.0 million or 50% of Post-Farm Gate investment and 21% of overall Programme investment.
- By the end of this funding year FY15B around $21.0 million will be spent, leaving a further $15.0 million to be spent by the end of the Programme. This implies that Theme 3 is currently around 58% through its investment.
- Theme 3 is managed by a Theme Leader and work is undertaken both at the Fonterra Research and Development Centre (FRDC) in Palmerston North and student and academic researchers across a range of universities.
- Specifically Fonterra aims to commercialise the resulting innovation through more competitive processing and capturing market led opportunities. Within Fonterra, prospective New Technology Development (NTD) projects (funded by the Programme) aim to either provide options which may be transferred to New Product Development (NPD) projects (funded solely by Fonterra) for further development and commercialisation or develop new technologies or methodologies that will meet the future needs of the business. Zespri is also in this Theme, examining the structure of kiwifruit to identify and develop opportunities for better managing the harvest to consumer supply chain.

Investment Summary



Source: Business Plan FY2015, DNZ, Fonterra
Pre-Farm Gate administration costs have been prorated against its corresponding Themes, as has Post-Farm Gate administration costs and unscoped investment / unallocated funding.

Theme 3 Summary Analysis: Overview

Objectives

- The table opposite summarises the investment to date and further planned investment by Objective as at June 2014. This analysis has been adjusted for a share of the Post Farm–Gate administration costs and the unscoped investment funding. Specifically, the Objectives related to Theme 3 are as follows:
  - 3.1.1 Capability Resourcing. Establish an appropriate governance structure for the Theme portfolio of activity. Ensure world-class scientific leadership and demonstrate excellent academic outcomes.
  - 3.1.2 Semi-Solid and Solid Foods. Understand the process / structure / property / sensory linkages in semi-solid foods so that new processes can be designed to deliver highly desirable nutritional and sensory experiences for selected dairy foods.
  - 3.1.3 Extreme Composition Fluids. Understand the aggregation forces between milk protein particles in ingredient manufacture and in applications in extreme composition protein beverages so that aggregation can be controlled and undesirable aggregation prevented.
  - 3.1.4 Restructuring Lactose was terminated in June 2011 due to a large permanent change in market demand for lactose. We understand this Objective was terminated prior to any Programme investment.
  - 3.1.5 Kiwifruit Structure. This Objective is co-funded by Zespri. It aims to understand the physical and biochemical aspects of the kiwifruit layers and the changes in these properties over time under environments encountered in extended supply chain in hot climates.
- The analysis shown opposite highlights Objectives 3.1.2 and 3.1.3 as the largest areas of activity and investment within this Theme, representing total Programme investment of $11.6 million and $5.4 million respectively. We understand that Objective 3.1.2 research is comparatively much further advanced that Objective 3.1.3

Objective Level Investment Analysis

$m	Act PTD	Budget FY15	Budget PTG	Total
Theme 3: Food Structures				
3.1.1 Capability Resourcing	2.9	0.9	1.7	5.5
3.1.2 Semi-Solid and Solid Foods	7.3	2.4	2.0	11.6
3.1.3 Extreme Composition Fluids	2.3	2.0	1.2	5.4
3.1.4 Restructuring Lactose	-	-	-	-
3.1.5 Kiwifruit Structure	1.2	0.2	0.5	1.9
Sub-total	**13.7**	**5.4**	**5.4**	**24.5**
Pro rated cost*	0.7	1.1	9.6	11.4
Total	**14.4**	**6.5**	**15.0**	**36.0**

Source: Business Plan FY2015, Fonterra

*Post-Farm Gate administration costs and unscoped investment / unallocated funding has been prorated against its corresponding Themes.

Theme 3 Summary Analysis: Timeline

Theme Development

- Following is a brief summary of the key events and influencing factors in the development of Theme 3. The chart opposite also highlights some of these events.
- An Academic Chair and expert panel for Theme 3 were appointed during 2011. The expert panel held a workshop to shape the Theme programme of activity in December 2011 and have reviewed Theme activity annually since 2013. An acting Theme Leader was in place during the initial development of the Theme until a permanent Theme Leader was appointed in January 2013.
- From our conversations with the Theme 3 Leader we understand that the majority of projects related to the underpinning science research in this Theme are undertaken by a range of universities. Master Research Agreements (MRAs) were signed with Massey and Auckland universities in 2011 and 2012 respectively and a specific project contract for the 'Mouthfeel-Rheology' project was signed with University of Queensland in 2013. Other projects in this Theme are mostly undertaken by post-doctoral researchers or Fonterra Research and Development Centre (FRDC).
- Projects in this Theme have produced a number of positive results to date. The Mozzarella projects and Natural Cheese Slice projects have each provided two options to NPD projects. The Endgame Creams projects have provided options for new NPD projects as well as transferring knowledge to enable successful delivery of existing NPD projects in Fonterra.
- In addition to the successes, this Theme has also terminated some projects. The Restructuring Lactose Objective was terminated early in the Programme due to a large permanent change in demand for lactose. The Natural Cheese Slice projects were also terminated during 2014 due to the effect of in market regulatory constraints. Despite being terminated, the Natural Cheese Slice projects were technically meeting milestones and the work undertaken on these projects is expected to be used in the future.

Timeline of Key Events

2011

- Feb 2011: Programme commenced. Acting Theme Leader appointed
- May 2011: Academic Chair appointed
- Jun 2011: Expert Panel established and Objective 3.1.4 terminated
- Aug 2011: MRA with Massey University
- Dec 2011: Expert Panel workshop to help shape the Theme activity

2012

- May 2012: MRA with Auckland University
- June 2012: Zespri and Fonterra sub-contract signed

2013

- Jan 2013: Permanent Theme Leader appointed
- Feb 2013: Expert Panel review completed
- Apr 2013: Rheology project initiated

2014

- Jan 2014: Mozzarella project provided option to NPD project
- Feb 2014: Expert Panel review completed
- Mar 2014: Mozzarella project provided option to NPD project
- Jun 2014: Natural Cheese Slice projects terminated
- Nov 2014: PSG approved additional Zespri milestones (3.1.5/4-3.1.5/5)
- Dec 2014: Cream project provided option to NPD project. New Zespri lead picked up the PGP responsibility

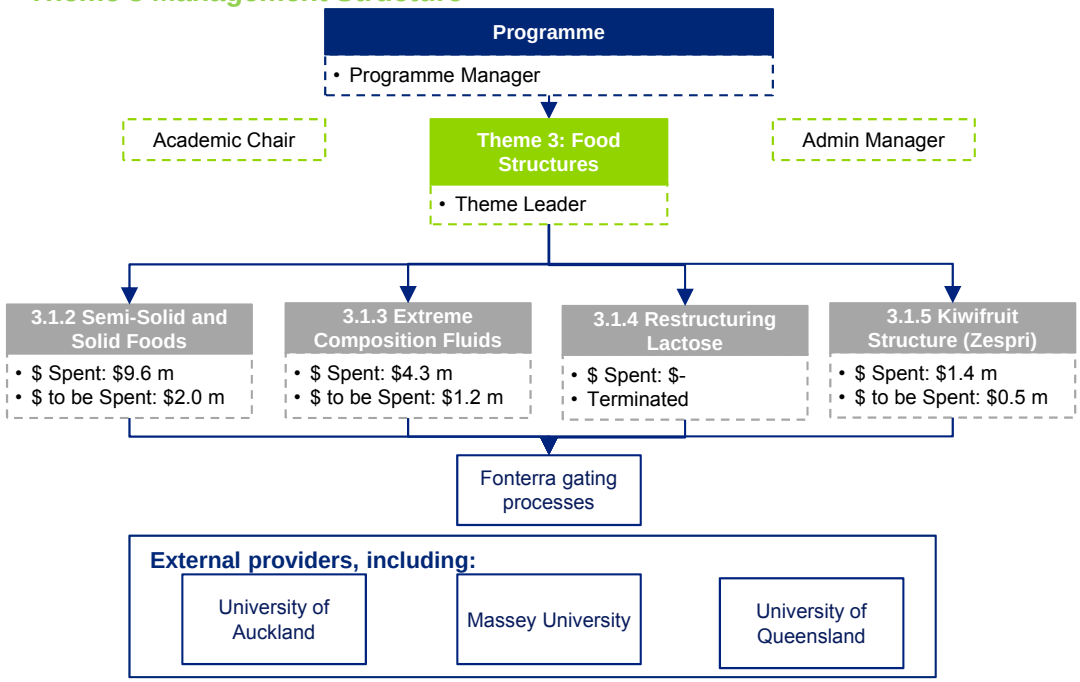
2015

- Feb 2015: Expert Panel review completed

Theme 3 Summary Analysis: Management Processes

- The Theme Leader has overall responsibility for the Theme including managing IP, budgets, expectations and issues as they arise and initiating risk mitigation strategies. The Theme Leader also leads scoping exercises for new programmes, prepares or assists with gating documentation and prepares documentation for PSG approval. Other responsibilities include identifying potential research providers and actively managing the contracting process for these as well as reviewing all outputs and ensuring technology transfer.
- In addition to the Theme Leader, an FRDC supervisor is appointed for each project (external and internal) to ensure that the project is tracking well, to identify and fill any capability gaps and to ensure that delivery is happening. Interaction will often be on a daily basis and must be at least fortnightly. Larger projects may also have a dedicated project manager to co-ordinate activity.
- New projects are initiated at FRDC and are signalled as developing projects for approval in the Programme annual business plan. All FRDC projects (including projects within the Programme) must go through an initial business case gating process within Fonterra. If the project passes the gating process, it is then fully scoped and appropriate milestones are determined with the research provider(s). Projects may then go back to Fonterra gating at the discretion of the specific Fonterra governance team before being taken to the PSG to seek approval for moving from a developing project to an active project.
- There are two ways that projects may be transferred out of the Programme within this Theme. One method is that NTD projects (funded by the Programme) provide options which may be transferred to NPD projects (funded solely by Fonterra) for further development and commercialisation. NPD projects go through the internal gating process before initiation. Alternatively projects may develop new technologies or methodologies that will meet the future needs of the business.

Theme 3 Management Structure



$ Spent includes FY15B and $ to be Spent excludes unscoped investment / unallocated funding.

- There are a range of reviews that take place in relation to Theme 3 projects. Monthly reviews with the external project team are run by the Academic Chair and the Theme Leader, with the supervisors present. A six monthly review of external projects is run by the Chair and Theme Leader with a wide audience from FRDC. An annual review of progress of external and FRDC projects is undertaken by the expert panel, with a wide audience from FRDC. In addition to these reviews, Fonterra holds its own reviews of progress of both NPD and NTD projects (together) at approximately four monthly intervals and progress on milestone delivery of NTD projects is tracked monthly for accounting purposes.

Theme 3 Summary Analysis: Current State Analysis

- Our assessment included structured interviews with the Theme 3 Leader. In particular we focused in detail on Objectives 3.1.2 Semi-Solid and Solid Foods and 3.1.3 Extreme Composition Fluids.

Objective 3.1.2 Semi-Solid and Solid Foods

- Objective 3.1.2 Semi-Solid and Solid Foods has three key areas of focus, which are described as follows:
  - Mozzarella projects which are aimed at reducing processing costs while maintaining quality. The intended output from these projects is to provide the business with a range of options for new and improved cheese making processes and related plant design.
  - Rheology related projects which aim to improve the scientific understanding of the mouthfeel and texture of foods. The intended output from these projects is provide the business with a range of options for new product development.
  - Projects related to better understanding 'protein functionalities' and also 'casein mineral interactions' which aim to provide knowledge that will support a range of product developments and process improvements, including Mozzarella product development.
- Most of the foundation work or the underpinning science for these projects is undertaken at FRDC and Auckland, Massey, and Canterbury Universities. The rheology related projects are being undertaken by the University of Queensland.
- Despite a significant degree of technical difficulty so far, these projects have generally been progressing well with a range of options already provided through to NPD, including options related to reducing cost / increasing efficiency of Mozzarella production and a process lever that has already been transferred to current manufacturing. A table overleaf shows a range of outputs to date, both direct and indirect, or spillover.
- One of the major next steps in relation to Mozzarella product development is the design of cookers and mixers. This project is currently being scoped and two potential research providers have been identified to assist with this work. Completion of this work-stream will be an important step towards realising the commercial opportunities that have been created from the work to date within this area. The Theme Leader said there is a high degree of confidence that successful outcomes will be achieved.
- More generally, there is always a risk that once options are transferred to NPD, the decision is made by Fonterra to no longer pursue the options at the NPD internal gating because they are unlikely to produce any economic advantage.
- An example of project termination was the Natural Cheese Slice projects in 2014. Despite meeting its output milestones and providing options to NPD projects, these projects were terminated due to in-market regulatory constraints impacting the market size and opportunity. This demonstrates that ultimately market signals are driving Programme decisions. Arguably market related information should have fed into this suite of projects at an earlier point in the research and development process. At the point of termination, around $1.5 million had been invested into this area. We understand that the knowledge and learnings resulting from the Natural Cheese Slice projects may be used in the future, but at this point no immediate commercial advantage is expected to arise.
- Objective 3.1.2 Semi-Solid and Solid Foods is the largest area of investment within Theme 3 and contains a mixture of large ambitious projects related to process design together with some smaller projects focusing on more fundamental research. Despite technical challenges related to the inherent nature of the work, outputs and achievement are in line with plan. Naturally there are uncertainties and risks in relation to achieving the planned next steps. There is a high level of confidence that these will be navigated and successful outcomes will be achieved.

Theme 3 Summary Analysis: Current State Analysis

Objective 3.1.3 Extreme Composition Fluids

- Objective 3.1.3 Extreme Composition Fluids has two key areas of focus, which are described as follows:
  - Cream projects which are aimed at improving cream performance in culinary and whipping applications. The intended output from these projects is to provide the business with a range of process options to provide consistent cream performance in the face of seasonal milk variation as well as new and improved processes and related plant design.
  - Projects related to real time measurement, particle formation and growth kinetics aim to improve the scientific understanding of particle interactions that lead to instability in beverages and creams. This foundation work will be expanded in the new (developing) projects in these areas.
- For Objective 3.1.3, the foundation work is being undertaken at FRDC, while the foundation work related to particle interactions is being undertaken at Massey University and the University of Victoria, Melbourne.
- One of the major next steps in relation to the achievement of the goals for Objective 3.1.3 is a project to better understand the crystallisation behaviour of creams. Fonterra is in early stage discussions with a leading academic researcher in this field from the University of South Australia to assist with this critical next step. Compared with Objective 3.1.2 Semi-Solid and Solid Foods, there is a higher degree of difficulty and risk associated with Objective 3.1.3 Extreme Composition Fluids, because the work is at an earlier stage in the research process. Management confirmed real progress has been achieved that will help to support future growth in UHT culinary creams for Fonterra. However, consistent with all Fonterra food processing research and development work, there is also a risk that options transferred to NPD are not commercially progressed.

Classification	Project Description
Creams NPD Options	• Process control of seasonal variation in whipping creams • Process control of seasonal variation in culinary creams • Commercially relevant creams process
Mozzarella NPD Options	• Reduced cost/higher moisture Mozzarella • Reduced fat Mozzarella • Process control of moisture in Mozzarella products
Other NPD Options	• Technologies for fat reduction and moisture increase in a range of applications • Ingredients for beverages with no sedimentation

Academic Outputs	Number Achieved
Patents	2 provisional applications written
Publications	7 accepted, 2 submitted, 2 under review
Master Theses	4 completed
Conference Presentations	16 presented, 8 abstracts submitted for F15
Industry Workshop Presentations to Zespri	5 presented

- Ultimately, the decision to progress an option beyond NPD is based on the likelihood of achieving economic advantage. The NTD projects related to creams provide the underpinning knowledge that will enable NPD and achievement of the strategic business goals.

Theme 3 Summary Analysis: Current State Analysis

Other Projects

- Included within Theme 3 is Objective 3.1.5, which encompasses a programme of work that is co-funded by Zespri that seeks to better predict and segregate kiwifruit on their suitability for a given supply chain to ensure fruit arrives to the consumer at the correct state of ripeness. The ability of Zespri to effectively manage perishable products through an international supply chain is essential to the profitability of the kiwifruit sector and Zespri's brand equity. While not part of the dairy sector, the inclusion of this Objective within the Programme reflects the synergies between the dairy and kiwifruit sectors in the scientific approaches required. In particular, some of the technologies used to provide insights into the internal structure of kiwifruit have been applied to determine the 3-dimensional structure of cheese.
- Reflecting this, Objective 3.1.5 Kiwifruit Structure is comprised of five areas, the latter two being recent additions to the Programme:
  - 3.1.5/1 Non-Destructive Quality Assessment Tools. The development of non-destructive technologies able to perform epidermal or 'through skin' quality assessments to predict kiwifruit quality, with the aim of optimising storage performance.
  - 3.1.5/2 Supply Chain Performance. To improve supply chain performance by quantifying the temperature and humidity environments in Zespri's global supply chain. This involved large scale data capture along the global kiwifruit supply chain (completed December 2012) and which has been used to inform 3.1.5/3.
  - 3.1.5/3 Fruit Physics: Thermal. The intended output is the development of kiwifruit quality environment models to predict product quality.
  - 3.1.5/4 Non-destructive method for improving postharvest inventory management decisions
  - 3.1.5/5 Integrated Fruit Softening Model.
- The intended output from the project is to deliver savings in reduced product losses through the distribution chain, and higher value from delivering fruit with the optimal attributes for their markets.
- According to the quarterly report as at 31 December 2014, progress towards contracted outputs, milestones and use of funds are on track. Zespri has been making good progress in investigating methods of measuring the structure of fruit at different points in the supply chain and relating this to pre- and post-harvest factors. This has provided new insights into how fruit should be handled post-harvest. Data collected is also being used to develop predictive fruit texture and shelf-life models that will help to improve supply-chain performance.

Theme 3 Summary Analysis: Expert Reviewer Assessment

Overview of Activity

- This Theme is the largest of the Fonterra led Post-Farm Gate Themes and has a significant number of active projects, including a small group of Zespri projects. Projects are managed using the Fonterra project management and gating protocols. Some projects have been successfully completed and moved into the Fonterra Product Development pipeline and some have been terminated based on changes in the strength of the business case supporting the project.
- Project leaders report to the Theme Leader with most work undertaken internally by Fonterra, with some contracted out to national and international third parties. There is direct oversight by the Programme Manager with reporting on progress by the Theme Leader to the Programme leader and then to PSG.
- This Theme has successfully appointed an Academic Chair who works across the research activity both within and external to Fonterra while being based at Massey University. The Theme Leader and Academic Chair are working effectively together and are fully engaged with the success of the research, as well as the success of the graduate and post-graduate students.
- Research within the Theme is strongly supported by graduate student and post-doctoral appointments. Some publications are starting to emerge but the main focus, unsurprisingly, is on internal reports.

Advisory Processes

- The approach to advisory processes is classical with a strong standing international panel meeting once a year with appropriate terms of reference. There is some risk of conflicts of interest, as at least two of the panel are also engaged in the research activities of the Theme.
- However, these conflicts appear to be managed appropriately, in part by observation from other panel members. The panel participates in an open forum for all Theme participants and hears presentations from project leaders and associated students before it develops a report on progress with suggestions for future activity.
- Areas of weakness identified in the reports have been followed up effectively by either the Theme Leader or Academic Chair. The panel report is comprehensive, but would benefit from inclusion of a clear set of recommendations as they are currently buried in the body of the report commentary. Such a set of recommendations would also facilitate the maintenance of a log. as proposed in the full expert report. together with an action list and record of delivery.

Conclusions

- This Theme is well managed against the priorities of the Fonterra and Zespri strategies. Novel technology opportunities will be delivered to market through the Fonterra (or Zespri) product development pipeline. Success for the Theme will ultimately be measured by the number of new methods, processes and products successfully implemented by Fonterra or Zespri.
- While the standing expert panel has high international standing and delivers a robust report, there should be clearer identification of recommendations, perhaps through a standardised reporting template, together with maintenance of a log of those recommendations and actions including rebuttals. In addition, while the quarterly reports contain a summary table each quarter showing the researchers involved in Theme activity for Themes 3-5 (which is done well for Theme 3), a standard log should be maintained across Programme activity of all graduate students and post-doctoral fellow including successful completion of study or finding of permanent employment.

Theme 3 Summary Analysis: Overall Theme Assessment

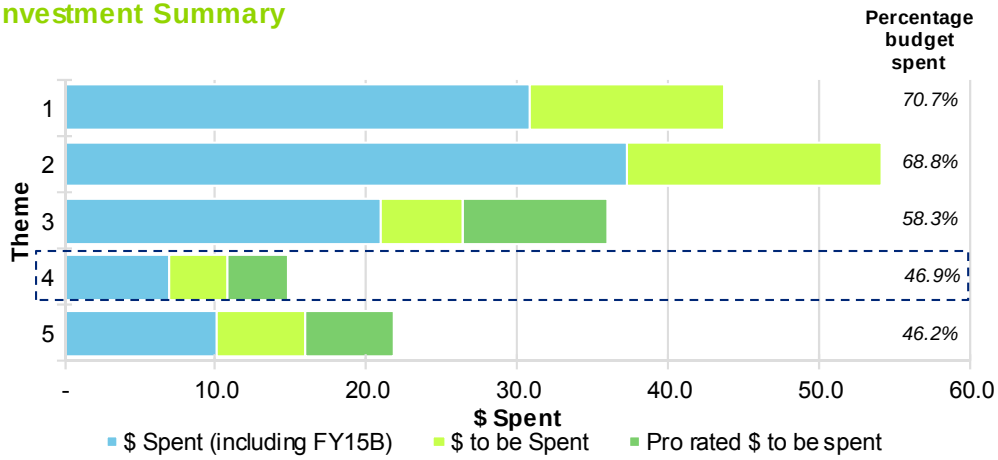
Area	Commentary	Assessment
Progress to Date	• Despite technical challenges related to the inherent difficulty of the work, outputs and achievements are in line with plan. A number of options have been presented to the business and the NPD, covering both Mozzarella and Creams. There have also been examples of good academic spillover, as highlighted by endorsements provided in the latest Expert Panel report (March 2015). • NPD options include: (i) two options related to reducing cost / increasing efficiency of Mozzarella production and a process lever that has already been transferred to current manufacturing; (ii) one process tool for objective assessment of Mozzarella performance on a pizza that is relevant to NTD, NPD and factory process development and control; (iii) an option for technologies for fat reduction and moisture increase in a range of applications; (iv) an option for creams process and other process levers relevant to managing seasonal variations in creams; and (v) an option for ingredients for beverages with no sedimentation.	
Likelihood	• We understand that Objective 3.1.3 Extreme Composition Fluids has a higher degree of difficulty and risk than Objective 3.1.2 Semi-Solid and Solid Foods, primarily because the work is at an earlier stage in the research process. • Management believes there is sufficient momentum to continue meeting technical milestones and deliver options to the business. We have not been provided with any evidence of the likely quantum or timing of the contracted outcomes, but we can (i) clearly understand the pathway and (ii) we broadly appreciate that the benefits are potentially material. • Importantly, we understand that the business is starting to move options transferred into NPD into commercial manufacturing environments.	
Key Risks	• As highlighted above, Objective 3.1.3 Extreme Composition Fluids work is at an earlier stage in the research process than Objective 3.1.2 Semi-Solid and Solid Foods. • Ultimately the decision to progress an option into and beyond NPD is based on the likelihood of achieving economic advantage. This remains a key risk, as highlighted by the termination of the Natural Cheese Slice projects, where around $1.5 million was spent developing options into Natural Cheese Slice projects. In this instance there was somewhat of a disconnect between the Programme and Fonterra marketing and regulatory teams. We understand that the internal learning was for the Programme project team to better challenge and interrogate the commercial input it received from the business. Fonterra manages these risks through alignment of Programme projects with its strategic priorities, and we believe it generally follows very robust internal processes.	
Conclusion	• Theme 3 is well managed against strategic priorities. The standing expert panel is of high international standing and delivers a robust report, and has strongly endorsed the quality work done in this Theme. • There are technical challenges related to the inherent difficulty of the work, but the outputs and achievements continue in line with plan. There is good evidence of output entering into the NPD processes and we understand the business is starting to move options transferred into NPD into commercial environments. • There is a high level of confidence that technical challenges will be navigated and successful outcomes will be achieved. The pathways to the opportunities are intuitively clear, but limited detail in this regard was provided due to commercial sensitivity.	

Theme 4 Summary Analysis: Overview

Theme Overview

- Theme 4 is about creating 'best in world' performance in food manufacturing through challenging industry processing and quality management conventions. Programme investment in this area is intended to create real-time quality tools and efficient, sustainable processing technologies that make Fonterra the first choice of consumers and business-to-business customers everywhere it chooses to compete. The Theme is primarily focused on milk powder processing because milk powders account for a large proportion of Fonterra's revenue.
- Specifically, Fonterra aims to commercialise the resulting innovation through raising the value of its products in the marketplace, based on product quality and safety, while also lowering manufacturing costs.
- The analysis opposite shows total Theme 4 investment relative to other Themes over the life of the Programme. For presentational consistency of this illustrative analysis we have prorated Post-Farm Gate administration costs and unscoped investment across the corresponding Themes. This analysis shows that Theme 4 total investment will be around $14.8 million or 20% of Post-Farm Gate investment and 9% of overall Programme investment.
- By the end of this funding year FY15B, around $6.9 million will be spent, leaving a further $7.9 million to be spent by the end of the Programme. This implies that Theme 4 is currently around 47% through its investment.
- Theme 4 is managed by a Fonterra Theme Leader and work is undertaken by a range of external providers, including the University of Auckland, the Auckland University of Technology (AUT), Milk Test NZ, Callaghan Innovation and Magritek who work closely with Fonterra's Advanced Process Control Group (APCG) at the Te Rapa factory. The research undertaken in this Theme related to food safety and quality is a fundamental aspect of Fonterra's long term strategy to become the world's most trusted source of dairy nutrition.

Investment Summary



Source: Business Plan FY2015, DNZ, Fonterra
Pre-Farm Gate administration costs have been prorated against its corresponding Themes, as has Post-Farm Gate administration costs and unscoped investment / unallocated funding.

Theme 4 Summary Analysis: Overview

Objectives

- The table opposite summarises the investment to date and the further planned investment by Objective as at June 2014. This analysis has been adjusted for a share of the Post Farm–Gate administration costs and the unscoped investment funding. Specifically, the Objectives related to Theme 4 are as follows:
  - 3.2.1 Capability Resourcing. Establish an appropriate governance structure for the Theme portfolio of activity. Ensure world-class scientific leadership and demonstrate excellent academic outcomes.
  - 3.2.3 Quality Compliance. Develop and establish international acceptance of a new statistical framework for the estimation and quantification of quality assessment and develop tools to infer quality using real-time data rather than assessing quality with end product testing.
  - 3.2.5 Quality Assurance. Develop flexible and adaptable tools and systems to ensure product integrity and traceability from the farm to the final consumer.
  - 3.2.2 Process Design was terminated during FY13 after completing all scoped projects and a Fonterra decision to not invest further in this area.
  - 3.2.4 Processing Options was related to 3.2.2 Process Design. Because a decision has been made from Fonterra not to pursue the alternative processing options developed in Objective 3.2.2, this Objective does not have any budget allocated to it. Fonterra is currently scoping options for what activity may be undertaken in this area.
- The analysis shown opposite highlights Objectives 3.2.3 and 3.2.5 as the largest areas of ongoing activity and investment within this Theme, representing total Programme investment of $4.2 million and $1.5 million, respectively.

Objective Level Investment Analysis

$m	Act PTD	Budget FY15	Budget PTG	Total
Theme 4: Quality Management				
3.2.1 Capability Resourcing	0.7	0.3	1.4	2.4
3.2.2 Process Design	2.0	-	-	2.0
3.2.3 Quality Compliance	1.3	1.1	1.8	4.2
3.2.4 Processing Options	-	-	-	-
3.2.5 Quality Assurance	0.3	0.4	0.7	1.5
Total	**4.3**	**1.8**	**3.9**	**10.1**
Pro rated cost*	0.3	0.5	3.9	4.7
Total	**4.6**	**2.3**	**7.9**	**14.8**

Source: Business Plan FY2015, Fonterra

*Post-Farm Gate administration costs and unscoped investment / unallocated funding has been prorated against its corresponding Themes.

Theme 4 Summary Analysis: Timeline

Theme Development

- Following is a brief summary of the key events and influencing factors in the development of Theme 4. The chart opposite also highlights some of these events.
- A permanent Theme Leader was appointed in June 2011 and an Expert Panel was appointed during 2012 which convened in November 2012 to provide input into the quality and direction of the research plan for the Theme. It is intended that this Expert Panel meet at 12-18 month intervals. Since the initial meeting, the Expert Panel have met again in March 2014 to review the Theme. The next review meeting is not yet planned. Fonterra's APCG also has input into the development of this Theme.
- An Academic Chair has not been appointed for this Theme. However, an honorary research fellow was appointed in December 2012.
- A major achievement in this Theme to date has been the development of a prototype software application (Minitool) to promote process control of vitamin dosing. This Minitool has been active since September 2013 on drier 4 at Fonterra's Te Rapa factory.
- In addition to the successes, this Theme has also terminated some projects. Objective 3.2.2 Process Design, which related to the development of viable alternative processing options to milk powder spray drying, was completed and terminated in June 2012. All scoped projects in this Objective were completed and Fonterra decided to not invest further in this area. We understand that the knowledge and learnings resulting from the Process Design projects may be used in the future, but at this point no commercial advantage is expected to arise. Projects related to Biomass Production for Biofuels were also terminated in September 2014 following the PSG strategy session.

Timeline of Key Events

2011

- Feb 2011: Programme commenced
- Jun 2011: Permanent Theme Leader appointed

2012

- Jun 2012: Objective 3.2.2 Process Design completed and terminated
- Nov 2012: Expert Panel workshop to help shape the research plan
- Dec 2012: Honorary research fellow appointed

2013

- Sep 2013: Minitool active on drier 4 at Te Rapa factory

2014

- Mar 2014: Expert Panel review completed
- Sep 2014: Biomass production for Biofuels projects terminated
- Oct 2014: Decision support tool to assist with the deployment of first generation Fourier-transform infrared (FTIR) technology tested in NZ

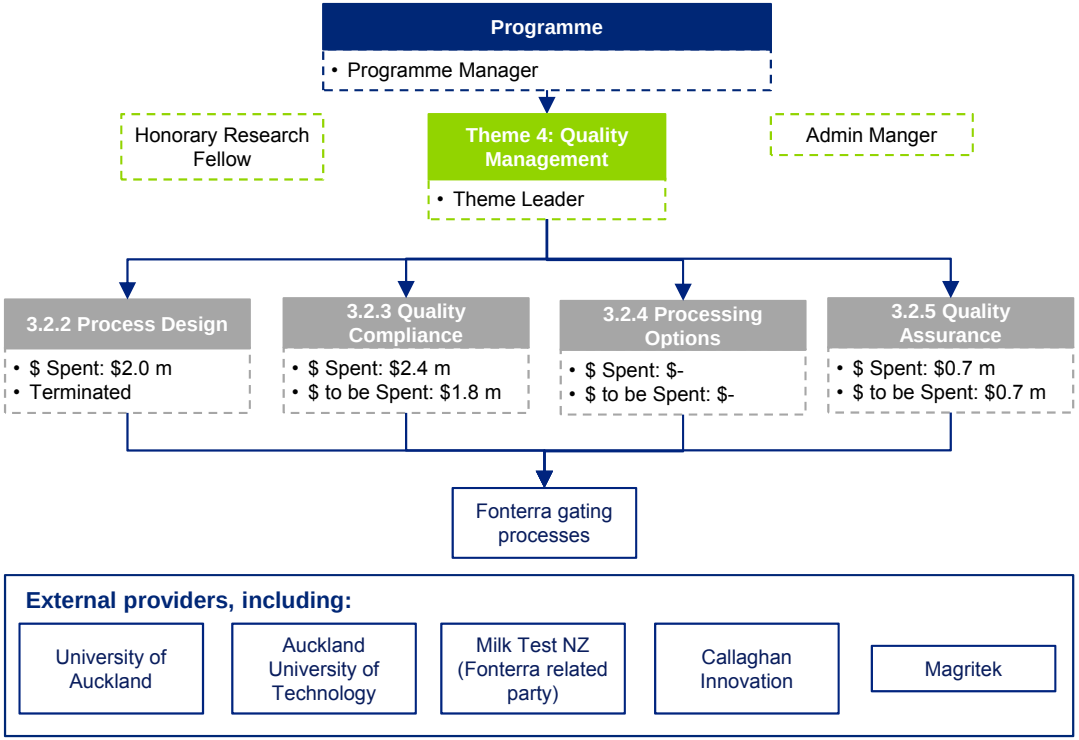
2015

- Feb 2015: National external panel meeting
- Mar 2015: Decision support tool for first generation FTIR technology deployed to Sri Lanka

Theme 4 Summary Analysis: Management Processes

- The Theme Leader has overall responsibility for the Theme, including managing IP, budgets, expectations and issues as they arise, and initiating risk mitigation strategies.
- Work is undertaken at the University of Auckland and Milk Test NZ, who work closely with Fonterra's APCG (at the Te Rapa factory). The Theme Leader prepares documentation for PSG approval, which APCG provides input into and reviews.
- This Theme has research activity managed using the Fonterra project management and gating protocols.
- There are two main ways that projects may be transferred out of the Programme within this Theme. One method is that the Minitools that have been developed in Objective 3.2.3 Quality Compliance (funded by the Programme) will be implemented into Fonterra's own process control applications by the APCG (funded solely by Fonterra). Alternatively, the prototype tools and options that are developed in Objective 3.2.5 Quality Assurance may be accepted by international regulatory bodies and implemented in processing plants nationally and internationally.
- An Expert Panel was appointed during 2012 that convened in November 2012 to provide input into the quality and direction of the research plan for the Theme. It is intended that this Expert Panel meet at 12-18 month intervals. Since the initial meeting, the Expert Panel have met again in March 2014 to review the Theme. The next review meeting is not yet planned.
- In addition to this standing panel, an ad hoc national external panel with expertise in the area of food safety assessment technology met in February 2015.

Theme 4 Management Structure



$ Spent includes FY15B and $ to be Spent excludes unscoped investment / unallocated funding.

Theme 4 Summary Analysis: Current State Analysis

- Our assessment included structured interviews with the Theme 4 Leader. In particular we focused in detail on 3.2.3 Quality Compliance and 3.2.5 Quality Assurance.

Objective 3.2.3 Quality Compliance

- Objective 3.2.3 Quality Compliance's main area of focus is the development of Minitools for process control in dairy factories. The intended output from these projects is to use these Minitools as a prototype to update Fonterra's process control applications, which will ultimately result in more consistent quality products.
- The University of Auckland and the Auckland University of Technology have been sub-contracted by Fonterra to develop the Minitools. The Fonterra APCG may then update their process control applications based on these Minitools (outside of Programme funding).
- Despite a moderate level of technical difficulty so far, these projects have generally been progressing well. Three years of process data from three factories has been compiled and two milk powder processing Minitools have been developed with the target of one Minitool currently in operation.
- The major next step is the development of more Minitools to obtain higher quality processing, leading to improvements in processing and reductions in quality failures. The major risk to this is that it is found that the physical attributes of milk powder are difficult to quantify and link to process variables.
- More generally, there is always a risk that there may be a lack of investment in the Minitools. An example of project termination was the Minitool development related to cheese processing, which was terminated after approximately six months due to strategic fit. However, we understand that investment in this area is a high priority and is aligned with strategy.
- Objective 3.2.3 Quality Compliance is the largest area of investment within Theme 4 and relates to the development of Minitools to provide more consistent quality products. Technical difficulty, particularly relating to the compilation of data, has been overcome and the Objective has one Minitool in operational use.

Objective 3.2.5 Quality Assurance

- Objective 3.2.5 Quality Assurance's main area of focus is the development of prototype tools and options that support the application of food safety and quality systems across Fonterra's milk collection network. The intended output from these projects is the ability to collect milk safely in geographically diverse areas with variable risk profiles as part of the overall Fonterra aspiration to double milk supply by 2025. This Objective includes the work on milk fingerprinting, which is described in more detail in the case study for Theme 4 on page 98.
- The University of Auckland and Milk Test NZ have been sub-contracted by Fonterra to undertake the majority of this Objective, with Callaghan Innovation and Magritek also involved in specific projects.
- Despite a moderate level of technical difficulty so far, these projects have generally been progressing well. Phase One has been completed, which was related to the development of prototype decision support tool for milk quality. The scoping of Phase Two is underway with Fonterra's Director of Milk Quality and Safety. Phase Two requires technology that is able to find chemically diverse compounds at a wide range of levels. Raman spectroscopy has been identified as a potential tool. We understand that investment in this area is a high priority and is aligned with strategy.
- Objective 3.2.5 Quality Assurance relates to the development of tools to enable Fonterra to collect milk safely in geographically diverse areas with variable risk profiles. Phase One of this Objective is now complete and scoping of Phase Two is underway.

Theme 4 Summary Analysis: Expert Reviewer Assessment

Overview of Activity

- As with Theme 3, this Theme has research activity managed using the Fonterra project management and gating protocols. Reporting is directly from project leaders through the Theme Leader to the Programme Manager and PSG. Most work is undertaken internally by Fonterra, but some is contracted out to AUT, Massey University and the Callaghan Institute.
- The Theme activity is largely on track with some peer reviewed journal publications in areas such as statistics and analytical chemistry but again, as expected, there is a focus on internal reporting. At least one project has had new technology moved into prototype testing in an offshore Fonterra processing plant.
- There is evidence of a less structured approach to the management and reporting of this Theme, making it difficult to follow activities (and associated expert advice) over time. Objective titles alter in different documents, while quarterly reporting of project status does not follow project numbering, or the order of the previous highlights section.

Advisory Processes

- A standing international panel with expertise in dairy process control and statistics has met twice, in November 2012 and March 2014. A different national external panel met February 2015 to focus on the area of food safety assessment technology, having specific expertise in analytical spectroscopy.
- The standing panel report of March 2014 had no specified recommendations. It made some general observations on looking for better problem definition across the programme of work and had commentary within its summary, which was strongly critical of understanding of best practice and project planning. Reporting to the PSG did not raise these concerns.
- The recent February 2015 panel report included recommendations in the body of the report that there be more robust consideration around sample presentation and data collection, as well as suggestions as to inclusion of limits of detection in the work.

Conclusions

- Overall indicators of successful delivery by this Theme will be numbers of new process control methods accepted by New Zealand and international regulatory bodies and implemented in processing plants nationally and internationally. So far, there has been initial pilot deployment of first generation technology in a Sri Lankan processing plant. The Theme is on track for successful delivery by 2018.
- There is a need for more consistency of Objective and project planning, together with reporting through the quarterly reporting against the Annual Reports and Business Plans. In addition, a more rigorous approach is needed to setting expectations of clear recommendations from expert panels.
- This should be supported by clear rebuttal or the actioning of agreed responses. The use of different expert panels for different parts of the Theme activity runs the risk that areas of research activity within the Theme could fail to be reviewed sufficiently frequently. This is of particular concern when serious issues are raised during the review processes and there is no external assessment of remediation.

Theme 4 Summary Analysis: Overall Theme Assessment

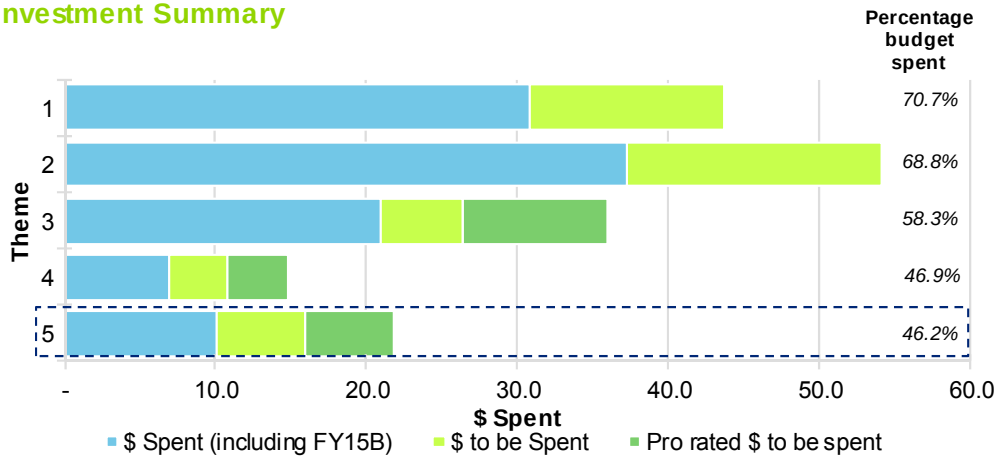
Area	Commentary	Assessment
Progress to Date	• There are currently two major areas of focus within this Theme. Objective 3.2.3 Quality Compliance, which aims to develop quality control processing software for milk driers (or Minitool applications), and Objective 3.2.5 Quality Assurance, which aims to deliver better milk quality testing tools for application across Fonterra's wider international milk collection network. • Both these Objectives are progressing in line with plan. Objective 3.2.3 Quality Compliance has successfully developed a prototype Minitool which is currently been used at the Te Rapa factory and Objective 3.2.5 Quality Assurance has successfully completed Phase One of its project plan.	
Likelihood	• Consistent with the above comments related to momentum and progress, Management is confident of successfully achieving the intended outcomes, but recognise there are uncertainties due to the technical risks and challenges in relation to this work. These will need to be navigated appropriately. • There appears to be a good alignment with business strategy. We understand a core plank of Fonterra's strategy is to grow its milk supply and build world class quality and food safety processes. While the pathways to achieving contracted outcomes are very clear, the workstreams are at a relatively early stage, and therefore there are risks around how pilot projects and prototypes can be successfully transitioned into BAU (e.g. having sufficient scale so as to be commercially and operationally viable).	
Key Risks	• There are some technical risks in relation to this Theme that we understand are predominantly about the physical limitations in relation to measuring the underlying properties of milk with increased precision. At the end of the day, this is largely what the foundation workstreams within these Objectives aim to discover. • There is a risk the business does not take up the resulting technologies, but the Objectives within this Theme have strong alignment with Fonterra strategy. Objective 3.2.2 Process Design was terminated in June 2012. We understand the resulting technology had significant merit but was considered too novel for an established large scale processor to widely implement and therefore was considered unlikely to be commercially successful for Fonterra. As highlighted, we do not believe similar issues exist in relation to Objective 3.2.3 Quality Compliance and Objective 3.2.5 Quality Assurance.	
Conclusion	• There is high engagement with the business and importantly with the APCG. Fonterra's General Manager of Quality and Food Safety also has proximity to the work undertaken in this Theme. External Expert Panels are also engaged to provide input into the quality of the research undertaken. Both Objectives 3.2.3 Quality Compliance and 3.2.5 Quality Assurance are progressing in line with plans. Notwithstanding, there is an element of technical risk. Management is confident that further planned technical milestones will also be met. • There appear to be very strong demand pull signals from the business in relation to the technologies being developed, particularly in relation supporting Fonterra's strategy to grow its milk supply and build world-class quality and food safety processes. The pathways to achieving contracted outcomes are very clear.	

Theme 5 Summary Analysis: Overview

Theme Overview

- Theme 5 is about investigating the role of new and existing dairy products in relation to the mobility needs of ageing adults (joint and muscle health and function), and the growth and development of children (brain development and function). Programme investment in this area aims to deliver opportunities to add value to branded nutritional dairy products in an international market where there is an increased requirement for robust science to support health claims and communications.
- The analysis opposite shows total Theme 5 investment relative to other Themes over the life of the Programme. For presentational consistency of this illustrative analysis we have prorated Post-Farm Gate administration costs and unscoped investment across the corresponding Themes. This analysis shows that Theme 5 total investment will be around $21.7 million or 30% of Post-Farm Gate investment and 13% of overall Programme investment.
- By the end of this funding year FY15B around $10.0 million will be spent, leaving a further $11.7 million to be spent by the end of the Programme. This implies that Theme 5 is currently around 46% through its investment.
- Theme 5 is managed by a Fonterra Theme Leader and work is primarily undertaken by external research providers, such as Auckland University.
- Specifically, Fonterra aims to commercialise the resulting innovation through producing and selling innovative dairy foods that provide robust, scientifically-validated mobility benefits to ageing consumers and cognition benefits to infants and children.
- Mobility research will initially target the healthy ageing segment, with the science and technology eventually anticipated to be rolled out to products targeting mainstream consumers.

Investment Summary



Source: Business Plan FY2015, DNZ, Fonterra
Pre-Farm Gate administration costs have been prorated against its corresponding Themes, as has Post-Farm Gate administration costs and unscoped investment / unallocated funding.

Theme 5 Summary Analysis: Overview

Objectives

- The table opposite summarises the investment to date and the further planned investment by Objective as at June 2014. This analysis has been adjusted for a share of the Post Farm–Gate administration costs and the unscoped investment funding. Specifically, the Objectives related to Theme 5 are as follows:
  - 3.3.1. Capability Resourcing. Establish an appropriate governance structure for the Theme portfolio of activity. Ensure world-class scientific leadership and demonstrate excellent academic outcomes.
  - 3.3.3 Mobility and Ageing. Undertake research that can underpin regulatory approvals and marketing of new clinically validated, high-value dairy products to support mobility in ageing consumers.
  - 3.3.4 Paediatrics. Undertake research that can underpin regulatory approvals and marketing of clinically validated, high-value dairy products to support cognition and healthy growth and development in infants and children.
  - 3.3.2. Global Nutrition Research was originally an area of focus in this Theme. Following Fonterra's strategy refresh, we understand that this area was no longer a priority. The Objective was essentially terminated, with only a small allocation of funding in FY15B.
- The analysis shown opposite highlights Objectives 3.3.3 and 3.3.4 as the largest areas of activity and investment within this Theme, representing total Programme investment of $4.4 million and $6.7 million respectively.

Objective Level Investment Analysis

$m	Act PTD	Budget FY15	Budget PTG	Total
Theme 5: Nutrition and Health				
3.3.1 Capability Resourcing	1.4	0.7	1.6	3.7
3.3.2 Global Nutrition Research	-	-	-	-
'3.3.3 Mobility and Ageing	2.4	1.2	0.8	4.4
3.3.4 Paediatrics	1.4	1.8	3.5	6.7
Total	**5.2**	**3.7**	**5.9**	**14.8**
Pro rated cost*	0.4	0.7	5.8	6.9
Total	**5.6**	**4.4**	**11.7**	**21.7**

Source: Business Plan FY2015, Fonterra

*Post-Farm Gate administration costs and unscoped investment / unallocated funding has been prorated against its corresponding Themes.

Theme 5 Summary Analysis: Timeline

Theme Development

- Following is a brief summary of the key events and influencing factors in the development of Theme 5. The chart opposite also highlights some of these events.
- An acting Theme Leader was in place during the initial development of the Theme. A permanent Theme Leader was appointed in December 2012. An Academic Chair was appointed in May 2012.
- Fonterra announced a strategy refresh in March 2012, which included a focus on growth in the mobility area through its Anlene brand and developing selected leading positions in paediatrics and maternal through the Anmum brand. This strategy refresh repositioned Theme 5 activity to being more focused on Fonterra's consumer business rather than ingredients.
- In this Theme Expert Panels are assembled to look at different aspects of the Theme when required. This is a different approach to the other Post-Farm Gate Themes. A Mobility Expert Panel held a workshop in September 2012 to shape the planned activity for Objective 3.3.3 and a second Mobility Expert Panel reviewed Objective 3.3.3 activity in November 2014. A Cognition Expert Panel held a workshop in April 2013 to shape the programme of activity for Objective 3.3.4.
- Major areas of activity in this Theme include acute muscle metabolism in healthy ageing consumers (approved in May 2013) and maternal and infant lipids and cognition (approved in March 2014).
- This Theme has also terminated some projects. Early mobility research related to metabolic syndrome was terminated due to a combination of strategic fit and errors in product supply, while early paediatric research related to immune projects was terminated due to a combination of strategic fit, technical success to date and technical robustness of the research approach.

Timeline of Key Events

2011

- Feb 2011: Programme commenced. Acting Theme Leader appointed

2012

- Mar 2012: Fonterra strategy refresh
- May 2012: Academic Chair appointed
- Sep 2012: Mobility Expert Panel and programme development
- Dec 2012: Permanent Theme Leader appointed

2013

- Mar 2013: DIAAS scoped and FAO report published
- Apr 2013: Cognition Expert Panel and programme discussion
- May 2013: Acute muscle research programme gating decision

2014

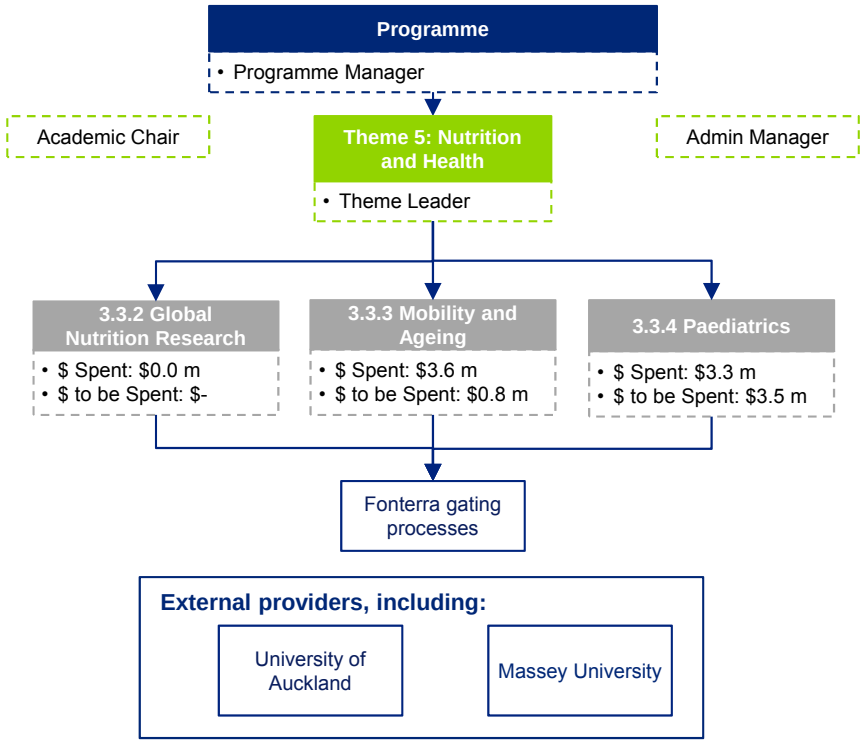
- Mar 2014: Maternal and infant lipids and cognition projects gating decision
- Jul 2014: Accelerated immobilisation project gating decision
- Nov 2014: Mobility Expert Panel review completed

2015

Theme 5 Summary Analysis: Management Processes

- The Theme Leader has overall responsibility for the Theme. Most projects are carried out by external research providers, such as Auckland University, and are managed by the Theme Leader or FRDC staff.
- The Theme Leader meets with other Fonterra staff (including scientists, marketing and regulatory) to discuss and establish the key issues that this Theme will try to address. Those key issues are then taken into meetings with external experts who help to establish and advise on the necessary programme of work to address them.
- The planned activity is developed into more detail around the individual projects and likely timeframe for each, and communicated through internal approval (gating) processes to gain approval to start individual projects. The programme is then included in the Programme Annual Plan as developing projects. Projects are managed using a stage / gate process. When an investment decision stage is reached, the project goes back to the gating committee and then to the PSG.
- At the end of the Programme, projects will either be complete with outputs being used in the business, or projects will be at a key decision point where the business can decide if and how to progress them.
- Separate Expert Panels in this Theme have been used to develop the plans for mobility and paediatrics, with more focused Expert Panels then being used on an ad hoc basis to review and refine the plans.
- A Mobility Expert Panel held a workshop in September 2012 to shape the planned activity for Objective 3.3.3, and a second Mobility Expert Panel reviewed Objective 3.3.3 activity in November 2014.
- A Cognition Expert Panel held a workshop in April 2013 to shape the programme of activity for Objective 3.3.4.

Theme 5 Management Structure



$ spent includes FY15B and $ to be spent excludes unscoped investment / unallocated funding.

Theme 5 Summary Analysis: Current State Analysis

- Our assessment included structured interviews with the Theme 5 Leader. In particular, we focused in detail on Objective 3.3.3 Mobility and Ageing and 3.3.4 Paediatrics.

Objective 3.3.3 Mobility and Ageing

- Objective 3.3.3 Mobility and Ageing's main area of focus is the development of science to support new positioning for consumer brand Anlene that is broader than bone health. The science developed will be used to inform the design of new consumer products.
- The science will be used to prepare regulatory dossiers used to gain approval for messaging in advertising and promotion. This will help to drive new consumers to the Anlene brand and therefore increase market penetration and grow sales. The science developed in this Objective can also be leveraged to support Fonterra's specialty ingredients where relevant.
- The activity undertaken in this Objective includes studying the impact of nutrition on muscle, joint health and bone as a holistic approach to improving mobility. Underlying mechanisms of action, such as muscle metabolism, inflammation and innervation, will also be looked at as routes to impact mobility outcomes via nutrition. Most projects are carried out by external research providers, such as Auckland University.
- Phase One of this Objective focuses on the benefits of consumer-feasible doses of milk protein to stimulate muscle synthesis (which should lead to improved muscle function or protection of muscle loss due to inactivity). The major next step is human clinical trials. Generally, there is always a risk that the clinical trials do not find a significant effect on outcomes.

Objective 3.3.4 Paediatrics

- Objective 3.3.4 Paediatrics' main area of focus is the development of science to support consumer brand Anmum. The science developed will be used to create novel propositions for the Anmum brand, with new options to talk about brain development benefits.
- The science will be used to prepare regulatory dossiers used to gain permission where needed to talk about gangliosides in brain development and cognition. This information will be leveraged in consumer and healthcare professional communications to build awareness and credibility around the Anmum brand. This will drive sales and build reputation in order to grow market share.
- The activity undertaken in this Objective includes analysing breast milk for minor lipids components and using lipid enriched dairy streams to enhance these components in infant formula and maternal / toddler milks.
- Science will also be developed around the role of the specific components gangliosides and potentially ceramides to show their role in brain development and the value of dietary sources.
- The major next step is human clinical trials. Generally, there is always a risk that the clinical trials do not find a significant effect on outcomes.
- Objective 3.3.3 Mobility and Ageing and Objective 3.3.4 Paediatrics both relate to the development of science that will be used to prepare regulatory dossiers used to gain approval for messaging in advertising and promotion. The science developed in these areas will be an ongoing process.
- Both Objectives are achievable in terms of meeting their technical milestones, subject to significant positive outcomes in the planned human clinical trials. One of the major risks in these Objectives is whether regulatory bodies accept the science that has been developed to substantiate the related messaging. In order to mitigate this risk, the science in these Objectives is being carried out following recognised, accepted techniques and methodologies. This will be particularly important in Objective 3.3.4 Paediatrics.

Theme 5 Summary Analysis: Expert Reviewer Assessment

Overview of Activity

- As with Themes 3 and 4, this Theme has research activity managed using the Fonterra project management and gating protocols. Reporting is directly from project leaders through the Theme Leader to the Programme Manager and PSG.
- The research in Theme 5 was repositioned as a result of Fonterra strategic repositioning, after the Programme commenced. Unlike Themes 3 and 4, the research of Theme 5 is all contracted out to national or international research teams.
- This is a well-managed research programme, delivering to nearly all of its milestones and producing some publications in peer reviewed journals. As with Theme 3, the Theme Leader has successfully recruited an Academic Chair who takes a role in ensuring science quality across the programme of research.
- Delivery is through Fonterra internationally and has already led to new knowledge, supporting marketing of products in Malaysia. Delivery will be through Fonterra marketing and product development, based on provision of evidence to support product marketing and regulatory claims, as well as a number of concepts entering the Fonterra product development pipeline.

Advisory Processes

- Because of its later start, the advisory processes used by the Theme Leader have been predominantly used to provide advice on research focus rather than delivery. There have been two streams of advice:
  - Paediatrics, where a subset of a standing Fonterra international panel has been effective in helping build the new initiatives in the Programme; and
  - Mobility, where a group of national experts have provided advice as to direction and focus of the research, and more recently (November 2014) an assessment of progress.
- These groups have been somewhat fluid in their composition and also ad hoc in the timing of their meetings, as they were convened as the Theme Leader sought advice. The most recent report from a meeting of the mobility advisory group was focused on research results and future protocols, but with little attention to quality of performance. The Academic Chair was both a project leader and the report author.
- The approach to external advice taken so far has been appropriate in the building of the Theme research activity. However, now that both programmes are established, it would be more appropriate to appoint a single standing committee with expertise in both paediatrics and mobility (probably sourced from the existing panels), but also with more general nutrition to ensure that there is objective advice that encompasses international benchmarking and gap analysis. This is most important for the mobility stream of activity.

Conclusions

- While the Theme has been well served by the expert panels used so far, now that the work is well underway it would be desirable to develop a standing panel of international experts to annually assess quality and progress across the whole Theme. This is particularly important to retain independence of advice for the mobility research. Continuation of the current approach exposes the Theme Leader to risk of missing opportunities, and the Academic Chair to risk of conflict in taking accountability for overall research quality.

Theme 5 Summary Analysis: Overall Theme Assessment

Area	Commentary	Assessment
Progress to Date	• There are two major areas of focus within this Theme: Objective 3.3.3 Mobility and Ageing, and Objective 3.3.4 Paediatrics. These Objectives aim to provide research that will scientifically evidence the health benefits of milk products as specifically related to Fonterra's Anlene and Anmum brands, respectively. • Objective 3.3.3 Mobility and Ageing has successfully completed pre-clinical studies and this data has provided an important foundation for further planned work. Objective 3.3.4 Paediatrics has also successfully completed its pre-clinical studies and this data has been used to design an improved infant formula.	
Likelihood	• Objective 3.3.3 Mobility and Ageing has had good momentum and is meeting technical milestones. The next step is to prove anticipated nutritional health benefits and increased adult mobility through a series of clinical trials. Objective 3.3.4 Paediatrics also has achieved good momentum in respect of its technical milestones and is progressing to human studies. • Outcomes will be dependent upon being able to clinically measure the mobility and cognition benefits in a manner that satisfies various in-market regulators. Management acknowledge there are likely to be challenges on the way but at this point remain confident of success.	
Key Risks	• The main risk in relation to Objective 3.3.3 Mobility and Ageing is confirming nutritional solutions in relation to adult mobility function that are measureable and consumers can relate to and find compelling. • Risks in relation Objective 3.3.4 Paediatrics are more subtle and complex. Firstly, the actual benefits need to be proven at human level, but also any evidence of improved cognition needs to be demonstrated through tried and trusted techniques as regulators will be less inclined to approve novel approaches to establishing improved paediatric brain function. Fonterra manages these risks through regular engagement with its marketing and regulatory teams.	
Conclusion	• There is a good alignment with strategy and this Theme appears to be well managed. There is use of a range of expert panels. • Objectives 3.3.3 Mobility and Ageing and 3.3.4 Paediatrics are progressing in line with plans. Management remain confident clinical trials will be successful but recognise these investments clearly involve an element uncertainty and risk. • The commercial pathway for both of these Objectives are clear. This research will enable Fonterra to better position its Anlene and Annum brands and develop complementary marketing stories. If successful, there are likely to be material economic benefits.	

Pre-Farm Gate Case Studies

Developing Dairy Cow Genetics (Theme 1)

- LIC is using new genetics technologies to help produce healthy and more productive dairy herds as part of the Programme. Economic analysis shows results so far could enable genetic gain of the national dairy herd worth up to an extra 10% per year.
- The entire DNA of around 650 dairy bulls and cows has been mapped out and is now being investigated. The main research thrust is identifying which dairy cattle genes are associated with which economically important trait in the animals. The researchers are also looking at which genetic variations – of the 30 million that exist – cause measurable differences in the traits. This work started in 2011. So far the gene sequencing project has discovered 13 gene variations linked to important dairy cow traits such as mastitis, milk composition, production and animal health.
- One example is the discovery of variations of a gene called AGPAT6 that determine milk composition. This is helping researchers to better understand what goes on in a cow's mammary gland and how milk composition is regulated by genes. The find was reported in an international scientific journal.
- Overall, this work is helping the industry understand the best dairy cattle genetics for New Zealand and also improving the ability to predict future performance of animals based on their genetic profile. Over time, this will help the industry to increase the rate of genetic gain, while being able to rapidly adapt breeding objectives to address challenges, such as animal health and environmental sustainability.
- It also gives researchers the ability to identify unhelpful gene variations, such as ones that have been found to cause the termination of a pregnancy or a production of a particularly small calf. The use of DNA sequencing technology to identify the specific gene opens the door to reducing and perhaps eliminating its incidence. And while the main thrust is the New Zealand dairy herd, a fortuitous discovery is a gene that gives an animal better heat tolerance, which may be useful for dairy production in tropical countries. LIC also works closely with the University of Auckland who have used the same techniques used for bovine gene discovery to diagnose rare human genetic disorders at the Starship Children's Hospital.

Pre-Farm Gate Case Studies

Night Milk Powder Launched (Theme 1)

- A Korean company has recently launched a specialist milk powder that promotes sleep, using an ingredient developed by Synlait with funding from the Transforming the Dairy Value Chain Primary Growth Partnership programme.
- Sleepiz milk powder was launched in January 2015 through a Korean pharmacy chain, Olive Young. The key ingredient is supplied by New Zealand farmers who milk cows at dawn and dusk – when their milk has higher levels of the sleep-inducing hormone melatonin. Supplying farmers receive a premium payment for this milk. The Synlait ingredient, dubbed iNdream3 night milk powder, is named on the box, which contains 7 sachets of 15.5 grams. It offers the benefit of being an all-natural solution for people who want a better quality sleep.
- Within a few weeks of the commercial launch, Sleepiz was among the Korean chain's top lines in the beauty and wellness category, and is now being rolled out to several major supermarket chains owned by the same company. Synlait has worked with its Korean partners for over a year, with the first large-scale production run occurring in February 2014. Night milk production is organised in special runs, with around 40 farmers involved over the past year.
- Also, in separately funded work, Synlait has recently received the results from two years of independent clinical trials conducted by the Otago University Sleep Research Centre, which show that the night milk powder is likely to help people in three ways: it helps them go to sleep more quickly, they spend longer in the deepest phase of sleep and they function better the next day. These results are being formally presented and published.
- Synlait is working with partners in other markets to develop further opportunities for the night milk powder

Nutrient Adviser Certification (Theme 2)

- Dairy farmers now have access to recognised nutrient advisers as the result of a certification programme established under the Programme. Nutrients drive pasture and animal production on a farm, but losses from land to waterways and lakes, particularly of nitrogen and phosphorus, can lead to increased growth of weeds and algae.
- The Nutrient Management Adviser Certification Programme is helping dairy farmers get good nutrient management advice so they can plan to efficiently use nutrients for on-farm production − and minimise the potentially harmful losses.
- DNZ commissioned the Fertiliser Association in 2012 to develop the programme. Its aim is to build and uphold a transparent set of industry standards for nutrient management advisers to meet, to ensure they provide nationally consistent advice of the highest standard to farmers. Ninety-two fertiliser company staff and farm consultants are now certified as nutrient management advisers through the programme.
- To become certified, they have had to demonstrate they have appropriate qualifications or equivalent field experience. They must also have completed the Intermediate and Advanced courses in Sustainable Nutrient Management, which are available through Massey University, plus demonstrate that their skills and knowledge meet required standards through a competency assessment.
- Once gained, they maintain certification by completing a minimum of 15 hours of continuing professional development activities each year. The names of certified advisers are listed on the programme's website so farmers and the public can view them. An advisory with representation from across the sector oversees the qualifications.

Pre-Farm Gate Case Studies

Working Together (Theme 2)

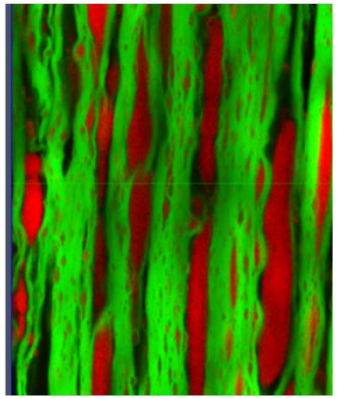
- Transforming an industry is a massive task and requires collaboration between organisations within and outside the New Zealand dairy industry. The Programme has joined with others in the primary industries to progress some initiatives where there is wider benefit.
- Several of the innovative techniques being developed in the Programme and other PGP programmes, for example, involve new forms of farm data recording, storage, analysis and reporting. This led them to identify the need for a code to guide fair behaviour and also standards to get consistency.
- The Programme has funded development of the new Farm Data Code of Practice and associated data standards, with a contribution from the FarmIQ Systems PGP in the first year and co-funding from the RMPP PGP from 2015. A wide range of organisations that deal with all types of farmers are seeking accreditation under the Code.
- Another example of collaboration is the establishment of the Primary Industries Capability Alliance (PICA), which was instigated by DNZ as part of the Transforming the Dairy Value Chain PGP. Beef + Lamb New Zealand came on board as the second governing member, and membership is growing.
- There has been widespread support across the primary industries for a coordinated approach under PICA for organising activities, such as engagement with secondary school teachers and students, rather than the historic fragmented approach.
- A fulltime PICA general manager was appointed in August 2014. The PICA members have agreed to use a “growing New Zealand” tagline for careers promotion materials. Government agencies with responsibilities for careers and capability – the Ministry for Primary Industries, Ministry of Education and Careers New Zealand – are participating in PICA working groups. The joint initiatives include the Primary Industries Partnerships with Schools (PIPS) pilot in three areas of New Zealand. Its aim is to understand successful partnerships between schools and primary industries in their local area.

Post-Farm Gate Case Studies

Endgame Mozzarella (Theme 3)

- Fonterra has for many years made Mozzarella using a “traditional” process. Cheese is made, and then stored for six weeks before being shredded, frozen and packed ready for use in Pizza restaurants.
- Prior to PGP, Fonterra had established a radically new manufacturing process for Mozzarella at Clandeboye that reduced the total time from six weeks to approximately six hours, as well as other cost advantages. The new process also provided a degree of product design flexibility not present in traditional mozzarella – creating the potential for a pipeline of innovative new products.
- However, implementation of such radical technology at commercial scale identified a number of scientific and technical challenges. There were major problems with commercial-scale processing and delivering the targeted product functional performance, and the investment looked like it may fail. A technical development team spent more than 18 months getting to the point where the plant could produce acceptable product – albeit by walking a tight-rope. Whilst the new technology had exciting potential, it was clear that Fonterra did not have the scientific background required to develop and further exploit this.
- Endgame Mozzarella was set up as part of the PGP programme to address the scientific knowledge gaps and to create options for future product development. The projects looked into fundamental aspects of the structure of mozzarella and how these impacted performance of the cheese on pizza. This included understanding the manner in which fat is held within the protein structure of the cheese, and how this changed based on processing conditions in the factory. This was the first large-scale application of a Food Structure Design approach by Fonterra.

Microstructure of Mozzarella Cheese



Key:
Red = Fat
Green = Protein

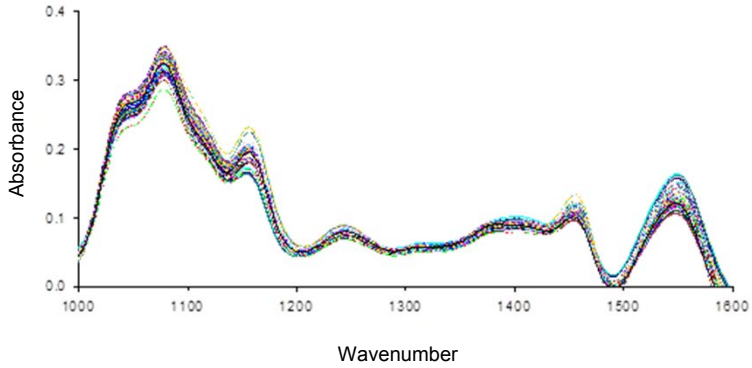
- From an early stage, scientific insights from the programme were applied to improve the operation of the Clandeboye plant, increasing confidence in the technology. In October 2013, the Fonterra Board approved $72m of investment to double the capacity; this expansion will be commissioned in time for the 2015/16 production season.
- The programme has since resulted in the initiation of two new product development (NPD) projects, with more to come. These future mozzarella products are a critical component of Fonterra’s strategy to “deliver on food service potential”.

Post-Farm Gate Case Studies

Milk Fingerprinting (Theme 4)

- Fourier-transform infrared (FTIR) spectroscopy is the analytical basis of Fonterra's milk payment system and has the advantage of being fast, inexpensive, and able to simultaneously quantify a range of components. It works by capturing a spectral fingerprint of an individual sample that is unique. Fonterra is a world leader in application of FTIR to dairy products.
- The 2008 melamine contamination crisis in China raised awareness of the risks of food fraud in the dairy industry and the tragic consequences that could result from commercially motivated adulteration of milk. Following from this, Fonterra developed a collaboration with Arla and Foss (an analytical instrument company) aimed at developing spectroscopic tools to detect adulteration of milk. This work had three phases:
  - 2010-11 Preliminary concept evaluation – proof that FTIR spectroscopy could detect a range of typical adulterants.
  - 2011-12 Development of targeted and untargeted FTIR models for detection of adulteration.
  - 2012-14 Validation of model performance and development of standard operating protocols for use.
- PGP investment was aligned with Phase 3 to develop decision support tools ready for implementation into Fonterra's milk pools. These tools take outputs from the statistical models and integrate them to facilitate business decisions. The decision support tool has been validated for Fonterra in NZ, and millions of milk samples have been processed. In early 2015 the milk-fingerprinting system was successfully rolled out to Fonterra's milk collection in Sri Lanka.
- In addition to the detection of commercially motivated adulteration, the milk fingerprinting approach has enormous potential in providing insights on other compositional factors in milk, providing the basis for a proactive milk quality management system that determines the suitability of milk early in the supply chain for use in the manufacture of specific products.

FTIR Spectra of a Number of Milk Samples



- When faced with a recent need to rapidly measure specific compositional characteristics, Fonterra was able to apply the PGP work to develop and deploy new statistical calibrations that enabled testing of over two million milk samples in a four month period at minimal additional cost. Using traditional wet-chemistry this would have cost at least $30 million and may not have been possible due to a lack of local (and international) capability to conduct the analysis at scale.

Post-Farm Gate Case Studies

Breastmilk Composition Measurement (Theme 5)

- Breastmilk is recognised as the best source of nutrition for infants. However, for a range of reasons many mothers choose not to breastfeed their children and instead rely on breast milk substitutes (infant formula) as a complete source of nutrition. In order to develop improved breast milk substitutes, it is important to understand the range of components found in human milk.
- The human breastmilk study compositional analysis project aimed to generate data on minor components in the breastmilk of Asian mothers using up-to-date analytical techniques. In particular, there was a focus on a more accurate understanding of the ganglioside content of human breastmilk.
- In collaboration with Malaysian and Chinese paediatricians, we have been able to collect breastmilk samples over lactation. Using state of the art analytical capability in Fonterra that measures gangliosides directly, rather than inferring content via a proxy measurement, we have measured a “typical” breastmilk figure. The results showed natural levels are higher than previously reported, providing a stronger rationale for targeting ganglioside content in future infant formula product development.
- This first phase of this research has been accepted for publication and will be published mid-2015.

Protein Quality Assessment (Theme 5)

- Dairy and other animal-sourced proteins are rich in essential amino acids and have a high nutritional value. Protein quality assessment provides a means to demonstrate the quality, in addition to the quantity, of protein in a food. The current default method for protein quality assessment under-represents the quality of dairy and other animal-sourced proteins when compared with plant-based proteins.
- The PGP programme supported early work on a new approach to protein quality assessment using an animal model to provide comparative data for a range of foods. The approach – called Digestible Indispensable Amino Acid Score (DIAAS) – uses digestibility as well as amino acid composition to determine the quality of a protein source.
- This information was used as part of a UN Food and Agriculture Organisation expert consultation on protein quality held in 2011 (subsequently published in 2013) which recommended adoption of DIAAS. This new method removes the disadvantage that high quality dairy and other animal sourced proteins face with the current method, and provides a more accurate view of the ability of various proteins to meet human nutrition requirements.
- Further support from the programme – as part of a coordinated global initiative – will help to validate that the recommended assay for DIAAS represents human digestibility of foods, enabling full adoption of the method.

Appendix 1: Glossary

In this Report capitalised terms have the meaning given to them as defined below:

AMD	Automated Mastitis Detection
ANMS	Audited Nutrient Management Systems
APCG	Advanced Process Control Group
ASL	Agriculture Services Limited
AUT	Auckland University of Technology
BAU	Business as usual
BCS	Body Condition Scoring
BV	Breeding Value
BW	Breeding Worth
Capability Expert	Jeff Coutts
CEFBM	Centre of Excellence in Farm Business Management
CNMA	Certified Nutrient Management Advisors
Contract	Formal agreement between MPI and Partners to undertake Programme over seven year commencing February 2011
DIAAS	Digestible Indispensable Amino Acid Score
DMS	Distributed Milking Systems
DNZ	DairyNZ Limited
Expert Reviewers	Independent expert reviewers
FDES	Farm Dairy Effluent System
FE	Facial eczema
Fonterra	Fonterra Co-operative Group Limited
FRDC	Fonterra Research and Development Centre
FSG	Farmer Steering Group
FTIR	Fourier-transform infrared
FY15B	Budgeted Programme investment for the financial year ending 30 June 2015
GHG	Greenhouse Gas
Landcorp	Landcorp Farming Limited
LIC	Livestock Improvement Corporation Limited
MACO	My Achievement and Career Opportunities
Management	For the purposes of this report we have broadly defined Management to reflect people we spoke to who have primary responsibility for delivering and/or overseeing projects and workstreams within the Programme
Minor Partners	Other smaller industry investors in the Programme including Synlait, Zespri, LIC, NZYF, ASL and Landcorp.
MPI	Ministry for Primary Industries
MRAs	Master Research Agreements
NPD	New Product Development
NTD	New Technology Development
NZAEL	New Zealand Animal Evaluation Limited
NZYF	New Zealand Young Farmers
OAG	Office of the Auditor-General New Zealand

Appendix 1: Glossary

In this Report capitalised terms have the meaning given to them as defined below:

Objectives	Common areas of activity beneath Themes
Partners	Fonterra and DairyNZ
PFP	Profit from Productivity
PfX	Partnership for Excellence
PGP	Primary Growth Partnership
PICA	Primary Industries Capability Alliance
PIME	Permanently Installed Milking Equipment
PLM	Professional Land Managers
PMO	Programme Management Office
Post-Farm Gate	Includes Themes 3 to 5, as sub-contracted to Fonterra
Pre-Farm Gate	Includes Themes 1 and 2, as sub-contracted to DNZ
Programme	Transforming the Dairy Value Chain Primary Growth Partnership Programme
Progress Review	Progress review of the Dairy Value Chain PGP
PSG	Transforming the Dairy Value Chain Programme Steering Group
PTD	Programme To Date, being actual Programme investment as at 30 June 2014
PTG	Programme To Go, being forecast investment from 1 July 2015 to 1 February 2018
RBN	Rural Business Network
RMPP	Red Meat Profit Partnership
RPs	Rural Professionals
SAB	Scientific Advisory Board
SAC	Science Advisory Committee
Science Expert	Tricia Harris
SIL	Strategy and Investment Leader
SMASH	Small Milk and Supply Herds Trust
SMEs	Subject Matter Experts
SoF	Summary of Findings
Synlait	Synlait Milk Limited
Themes	Programme themes, being Themes 1 to 5
Theme 1	On-farm Innovation
Theme 2	Capability and Capacity
Theme 3	Food Structures
Theme 4	Quality Management
Theme 5	Nutrition and Health
TOR	Terms of Reference
Zespri	Zespri Group Limited
VLB	ViaLactia Biosciences Limited, a subsidiary of Fonterra

Appendix 2: Key Review Questions

Key Review Questions

Governance and Project Execution

- Are the governance processes ‘fit for purpose’ or both appropriate and pragmatic?
- Does the Programme use appropriate management systems and governance to manage the quality of the science. And are they working?
- Is there sufficient transparency between project activity and overall goals?
- Is there clarity with regards to the eligibility criteria defining what project activities may, or may not, be undertaken as part of the Programme?
- Are project activities relevant to both the Programme goals and wider industry strategies. This will be required to achieve follow-on industry investment?
- What opportunities are there to collaborate with other sectors? And is this being done?

Problems and Benefits

- Has the Programme adapted / responded to any major changes in the industry and macro environment? And are the goals and targets still relevant in light of these changes?
- Is the Programme producing outputs at a rate, of a quality, and of scale, that gives confidence in the ability to achieve expected outcomes?
- Are the resulting technologies and outputs being effectively transferred / adopted into industry? And is the adoption rate / intensity sufficient to deliver intended benefits?
- Will the delivered increase in capabilities be sufficient to meet industry needs given significant recent industry expansion?
- How adequate is the Programme “reach”. Does the Programme reach enough farmers and RPs and also the right people?
- Understanding the supporting economic modelling and how the benefits as quantified can be related to project activity and outcomes?

Appendix 3: Programme Students and Publications (as at Dec 2014)

All (complete and in progress)	Theme 1[1]	Theme 2[1]	Theme 3	Theme 4	Theme 5	Total
Postdoctoral fellow	-	-	9	5	2	**16**
PhD	5	4	11	3	1	**24**
Research Officer/Assistant	-	-	2	2	1	**5**
Masters	-	2	4	-	1	**7**
Honours	-	2	-	-	-	**2**
Btec	-	-	-	-	1	**1**
Summer Student	-	-	3	-	2	**5**
Total	**5**	**8**	**29**	**10**	**8**	**60**

[1]Note: Themes 1 and 2 tallies reflect the minimum student count.

Description	Theme 1[1]	Theme 2[1]	Theme 3	Theme 4	Theme 5	Total
Accepted Publications / Journal Article	13	5	4	6	7	**35**
Submitted Publications	-	-	6	9	12	**27**
Conference Presentations / Posters / Abstracts	8	15	20	12	3	**58**
Industry Standards and Guides	5	6	-	-	-	**11**
Internal reviews, training courses & workshops	-	-	10	-	-	**10**
Total	**26**	**26**	**40**	**27**	**22**	**141**

[1]Note: Themes 1 and 2 tallies reflect minimum (major) publication count and may not capture all publications to date.

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