

A MESSAGE FROM THE DIRECTORS OF THE RIDDET INSTITUTE

The Riddet Institute is a national Centre of Research Excellence focusing on the boundaries between food science and digestive physiology and human nutrition. The Institute is a partnership of five organisations: The University of Auckland, AgResearch, Plant & Food Research, Massey University, and the University of Otago and so it is truly an organisation that encompasses the entire New Zealand science sector.

Our primary objective is to conduct original research of the highest international quality and to build capabilities for New Zealand's food industry through knowledge discovery and advanced education. In addition to these primary objectives, however, the Institute has assumed a leadership role in New Zealand agri-foods, with initiatives such as Riddet FoodLink, the Riddet Institute annual summit meetings and various key publications. It was in this context that the Riddet Institute took up the challenge posed to it by industry stakeholders in 2010, to develop a New Zealand strategy for science and education-led economic advancement of the New Zealand food industry. The Institute thus appointed an independent Thought Leadership Team, chaired by Dr Kevin Marshall, and with a secretariat headed by Dr Mike Boland of the Riddet Institute.

We exhort you to consider and further develop the arguments contained herein, as a springboard to action, so that the nation's as yet fully unrealised potential in agri-food economic development is fully secured. To a large extent the Riddet Institute has had a facilitatory role, and the opinions expressed and the "call to action" are very much those of industry as conveyed through the Thought Leadership Team.



Distinguished Professor Paul Moughan
Co-director, Riddet Institute



Professor Harjinder Singh
Co-director, Riddet Institute

A Call to Arms

A CONTRIBUTION TO A NEW ZEALAND AGRI-FOOD STRATEGY

Report from the Riddet Institute Agri-Food Thought Leadership Team

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June 2012

Jon Morgan, in the DomPost (1 June 2011), asked:

“What can be done to lift New Zealand’s economic performance?”

Quoting a letter from the late Dr Bill Kain, an agricultural scientist and science administrator, Morgan answered:

“A national strategy based on agriculture would be a start.”

This view on the need for a national agri-food sector strategy has been expressed many times, particularly since the publication of the Food and Beverage Taskforce report in 2006.

At the request of the Riddet Institute we have researched the agri-food sector’s performance and potential, and consulted with a wide range of key personnel to prepare a contribution to such a strategy, focusing on research, development and capability – the competencies of the Riddet Institute.

New Zealand is vitally dependent on the successful processing, exporting and marketing of food from its agricultural production (agri-food) for its current and future wealth. The Government’s Economic Growth Agenda calls for a trebling of the real value of food exports to about \$60 billion (in real terms in 2011 dollars) by 2025 if we are to achieve the standard of living to which we aspire. This is a real compound annual growth rate (CAGR) of around 7% over the next 13 years, a daunting task, particularly in the current economic environment.

In this report, we examine the magnitude of the challenge for the agri-food sector in the context of New Zealand’s resources and capabilities and the potential market opportunity in a world with an expanding population and rising wealthy middle classes. The report outlines transformational strategies and enablers that will drive the growth of the agri-food sector in a sustainable way. We appreciate that most of these are neither new nor unique but they remain the way forward – but only if they are implemented and driven in a co-ordinated and collaborative way. There are also risks along the path that need to be kept in focus.

Urgent action is required from the leaders of the agri-food business sector in partnership with Government. It is frustrating that such action has not occurred to anywhere near the extent required, despite the frequent and consistent calls over recent years. There is urgency for action because time is short and New Zealand faces a mediocre economic future if it does not rapidly and significantly grow its wealth and simultaneously protect its precious resources.

The key step is the formation of a peak body, an Agri-food Board, to drive the other recommendations made in this report.

It is our hope that the Primary Industry Chief Executives’ Boot Camp, the first one of which is to assemble in August, will consider our recommendations and take the necessary steps to form the Agri-food Board.

It is our wish that this report will stimulate a dialogue that will lead to action.

Urgency is a keynote of this report: it is a Call to Arms.

Kevin R Marshall (Chair)

On behalf of the Riddet Institute Agri-Food Thought Leadership Team

June 2012

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In April 2010, the Riddet Institute convened the Agri-Food Summit, *Positioning New Zealand's Research and Education Resources* [1]. A clear outcome of that Summit was agreement that the development of a strategy for agri-food research in New Zealand would be timely and that the Riddet Institute should continue to provide leadership by spearheading the development of such a strategy.

The challenge was accepted and the Riddet Institute appointed and supported a Thought Leadership Team with a brief to consult widely with key personnel to:

“Develop a contribution to a high level agri-food strategy for New Zealand, with particular focus on future food research, development and education needs that will support the development of the agri-food industry in the years to 2050”.

Government's Economic Growth Agenda targets increasing exports to comprise 40% of GDP by 2025. The aim is to sustainably grow earnings from food and beverage industries (agri-foods), high value manufactured goods and services, tourism, and minerals and petroleum. The current Agenda calls for a near trebling of the real value of agri-food exports, from \$20b to \$58 billion [2] (2009 figures).

To achieve the proposed target a compound annual growth rate (CAGR) of around 7% will be required. A continuation of the growth rate achieved from 1985-2011 would provide a CAGR of around 3% and we estimate that published strategies will increase this to about 4%. The result is a gap of about 3% growth (CAGR) required in addition to business as usual growth. Closing that 3% gap is the focus of this report.

There are many strategies proposed and being implemented to lift the performance of individual businesses, industries within the sector, or agri-food as a whole. The strategies we have identified fit into four general categories we have labelled transformational strategies. We endorse efforts to progress all four of these transformational strategies:

Strategy 1 is a continuation of business as usual.

Strategies 2 and 3 will be needed to contribute the targeted extra 3% CAGR. Both these strategies will require increased effort and capital. They will also require development and deployment of new capabilities to meet their potential.

Strategy 4 is essential to meet customer requirements and to be allowed to retain the right to farm and process in the future. There are price premiums available for sustainability and product integrity already and these may grow in the future.

None of these strategies is new – all have been raised in one or more previous reports. They are all critically important and complement one another but they have not yet been adequately acted on to achieve the level of growth targeted for the sector.

The targets are expressed as revenue goals but it is important to recognise that volume alone is not the purpose of the strategies. The focus on growing customer value thus enabling higher prices, and reducing costs, will together contribute to higher margins and so to more profits for sector businesses. Lower costs may allow lower prices that may make it possible to compete in markets which are otherwise inaccessible.

Government has taken many effective steps in the last few years that will contribute to accelerating growth of the agri-food sector. The agri-food industry must now make the most of the opportunities provided by these initiatives. The targets have been set. Government has set direction and committed increased effort and resources. Industry must now act.

TRANSFORMATIONAL STRATEGIES

- 1. Selectively and profitably increase the quantities and sales of the current range of agri-food products.**
- 2. Profitably produce and market new, innovative, high value food and beverage products.**
- 3. Develop value chains that enhance the integrity, value and delivery of New Zealand products and increase profits to producers, processors and exporters.**
- 4. Become world leaders in sustainability and product integrity.**

Our vision for New Zealand's agri-food sector in 2025 is profitable overseas earnings of \$60 billion, sustainably contributing to New Zealand's social, environmental and economic well-being in a changing world and ensuring New Zealand continues to be a great place in which to live and pursue a career.

A SWOT (strengths, weaknesses, opportunities and threats) analysis was completed as part of this project.

There are many worthwhile strengths and opportunities to lift the output and profitability of agri-foods. Those strengths and opportunities provide the foundation for success of the transformational strategies listed above.

The weaknesses identified are important. The SWOT analysis, supported by our research, indicates that the agri-food sector currently lacks the capability and organisation to take full advantage of the opportunities available. Remedying the weaknesses identified in the SWOT analysis requires increased investment in the capability of the agri-foods sector to grow profitable businesses. Almost all of the weaknesses can be reduced via industry and Government efforts. Overcoming the weaknesses identified is, in our opinion, the best way to accelerate the growth of the agri-foods sector to reach its potential and achieve Government's targets.

Rapid growth will only be achieved if the strategies are implemented effectively. Agri-food industry participants need to know what to do, how to do it and to develop the resources they need to do it effectively.

There are many reports on the agri-foods sector, or parts of it, defining what should be done but our assessment is that many sound recommendations have not yet been implemented successfully. To understand why, we asked several leading industry participants to tell us what they think are the obstacles to effective implementation. Their responses include:

- *New Zealand has not focused strongly on how to develop the capabilities to grow wealth.*
- *There has been a lack of leadership (particularly from*

industry chief executives) to animate the process and carry it through, and many New Zealanders wait for Government to take the lead.

- *The concept of a peak body engendered polarised and ambivalent views and there was no consensus around the peak body's role, authority, accountability, resourcing, action, etc. Past or proposed peak bodies traditionally had no teeth and yet a peak body was still seen as a means of providing the necessary leadership to drive the required changes and to provide a long-term focus that would survive the political changes that follow the short electoral cycle.*
- *Industry has not committed to a strategy: just vague goals with a lack of comprehensive and resourced plans to implement the recommendations made.*
- *Government structures are siloed and not conducive to coordinated efforts.*

Our most important proposal is to establish an Agri-food Board that will be the focal point for sector leaders to work together, and for industry to lead the work with Government, overcoming barriers to implementation.

Targets are easy. The strategies are widely understood already and are not difficult to communicate. Implementation will make the difference between success and failure. We have proposed a set of enablers to drive implementation. See text box below.

The enablers do not bear a one-to-one relationship to the strategies. Each of the strategies will depend on a contribution from several, if not all, of the enablers.

This report is a launching pad for New Zealand's accelerated, sustainable growth in agri-business – it is a Call to Arms.

ENABLERS

- 1. Develop transformational industry and Government leadership.**
- 2. Develop strong consumer-driven export marketing of branded consumer and ingredient products.**
- 3. Increase capability and skills of the agri-food industry and supporting industries.**
- 4. Increase the amount and effectiveness of investment in innovation, research, development and extension supporting the agri-food industry.**

My vision for the New Zealand of my grandchildren is “a place where they would see an opportunity to live the life they would best imagine for themselves. That would be something to aspire to as a nation wouldn't it? It's about creativity. It's about anything that gives jobs, creates prosperity, enables us to do the things we want as a nation and doesn't focus on money for its sake but for creating a better society. It's not about pie in the sky. Yes, we have heard it before, but who's actually done it? That's the point. We need leaders that are going to do it. Stop talking about it and stop reshuffling chairs on the Titanic.”

Sir Paul Callaghan; from an interview published in the DomPost just after his death.
Source: www.stuff.co.nz/dominion-post/news/6636553/Sir-Paul-Callaghan-Kiwi-Visionary-looks-back-on-life.

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The challenge was accepted and the Riddet Institute appointed and supported a Thought Leadership Team with a brief to consult widely with key personnel to:

“Develop a contribution to a high level agri-food strategy for New Zealand, with particular focus on future food research,

development and education needs that will support the development of the agri-food industry in the years to 2050”.

New Zealand's future prosperity depends on accelerating export growth and the agri-food sector is expected to make a large contribution to the targeted growth.

Our vision for agri-foods in 2025 is that the sector makes an even greater contribution to New Zealand's social, environmental and economic well-being in a changing world:

- **New Zealand's agri-food sector is globally recognised and valued by customers and consumers as a trusted supplier of quality goods and services that meet market demands and for which they pay a premium;**
- **Using innovative processes, agri-food businesses have profitably increased overseas earnings to \$60 billion p.a., thereby contributing 50% of the Government's 2025 goal of raising the contribution of total exports from 30% to 40% of GDP;**
- **Sufficient R&D and capability building has been undertaken such that agri-food businesses are poised to continue to grow export revenue profitably;**
- **Sustainable practices are embedded across all agri-food production and manufacturing industries;**
- **Product standards and regulations have developed in New Zealand in conjunction with industry and are considered to be a source of competitive advantage rather than an imposed compliance cost;**
- **Employees in the agri-food sector enjoy salaries that are competitive with those of other industries and countries;**
- **Government agencies and the private sector collaborate closely with a shared vision;**

and New Zealand continues to be a great place in which to live and pursue a career.

This contribution to an agri-foods strategy for New Zealand has been developed by the authors (see appendix 1) based on input from many agri-foods industry participants and representatives of Government and other agencies.

There are many businesses, large and small, striving to increase their sales and profits and those efforts have provided the historical growth of agri-food exports. Accelerating the growth will require “NZ Inc.” to do something more and to do things differently. The nature and scale of the challenge is summarised in the next chapter.

The 2010 Agri-Food Summit and our subsequent research reveal that a lot is known, and agreed upon, about where New Zealand should compete and what should be done. That understanding is summarised in the four high level strategies presented in Chapter 3.

Accelerating the growth requires doing something more than what individual firms acting separately are able to do. Government has launched many initiatives recently to contribute to this. Our conclusion is that business as usual will not suffice and that more can and should be done to

increase the export growth rate. The agri-food industry must take the lead in providing additional effort that should include significantly increased co-operative effort between the agri-foods sector and Government. Our proposals in Chapter 4 address the question of how New Zealand should compete more successfully.

WHAT IS AGRI-FOOD¹ AND WHO IS INVOLVED?

The agri-food sector comprises agricultural production and harvesting, food and beverage processing, packaging, transport to markets and retail outlets, marketing to customers and consumers, and ancillary businesses (information technology, fencing, fabrication, analytical services etc.). It encompasses whole foods, food ingredients and beverages. The sector involves private businesses and Government entities. It includes education providers, research organisations, trade unions, industry associations, border protection, sustainable environment advocates and local communities.

An overview of the various disciplines that support the sector is shown in Figure 1.

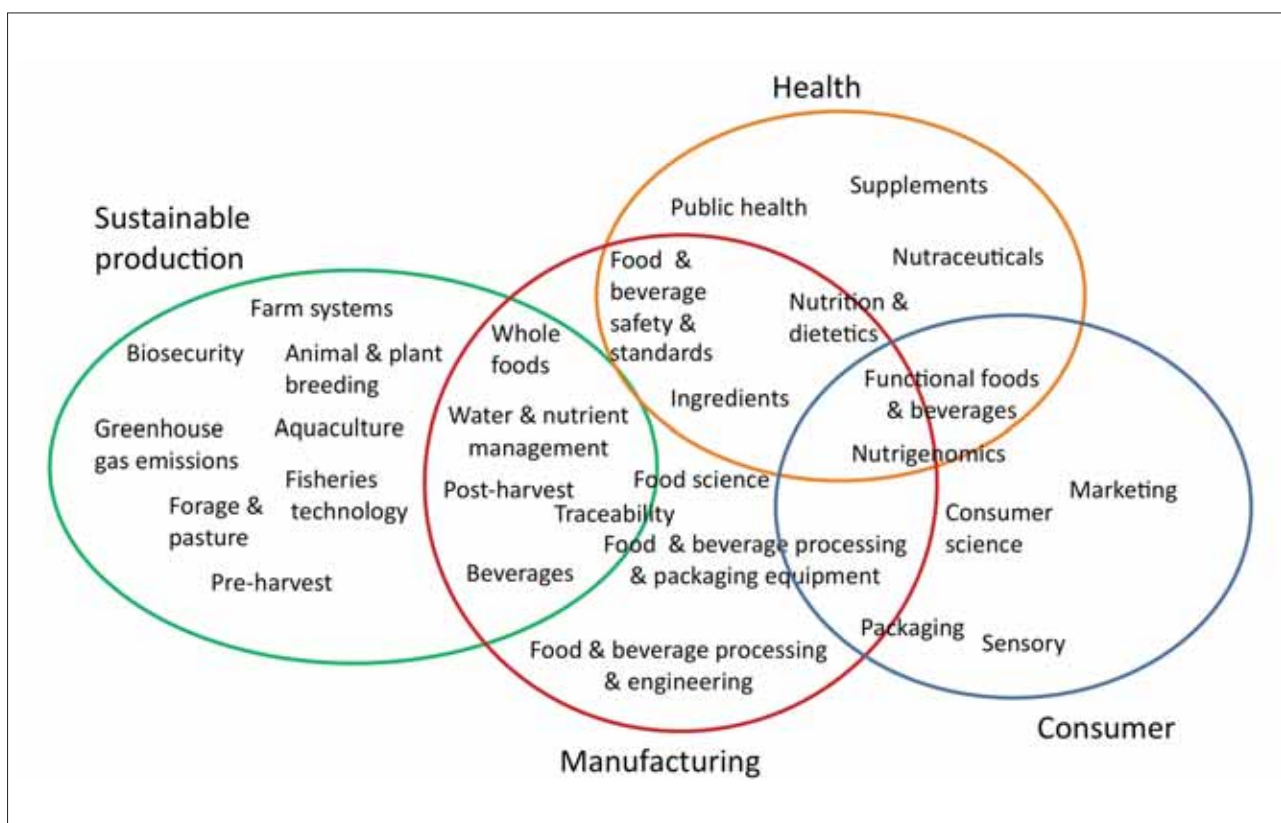


Figure 1: Scope of disciplines involved in agri-food (adapted from the Ministry of Research, Science and Technology (MoRST) Food Research Roadmap).

¹ We have opted to use the term ‘agri-food’ because it was the term used in the 2010 Agri-Food Summit that initiated this report and because we want to cover the whole of the value chain from soil to wellness. We are conscious that other terms have been used previously, including ‘food and beverage’, ‘food’, ‘primary’, ‘primary products’, ‘the cuisine business’ etc. We are not precluding any of these terms from our definition.

NEW ZEALAND NEEDS TO LIFT ITS AGRI-FOOD PERFORMANCE.

Government’s Economic Growth Agenda targets increasing exports to comprise 40% of GDP by 2025. The Government’s aim is to sustainably grow earnings from food and beverage industries (agri-foods), high value manufacturing goods and services, tourism, and minerals and petroleum.

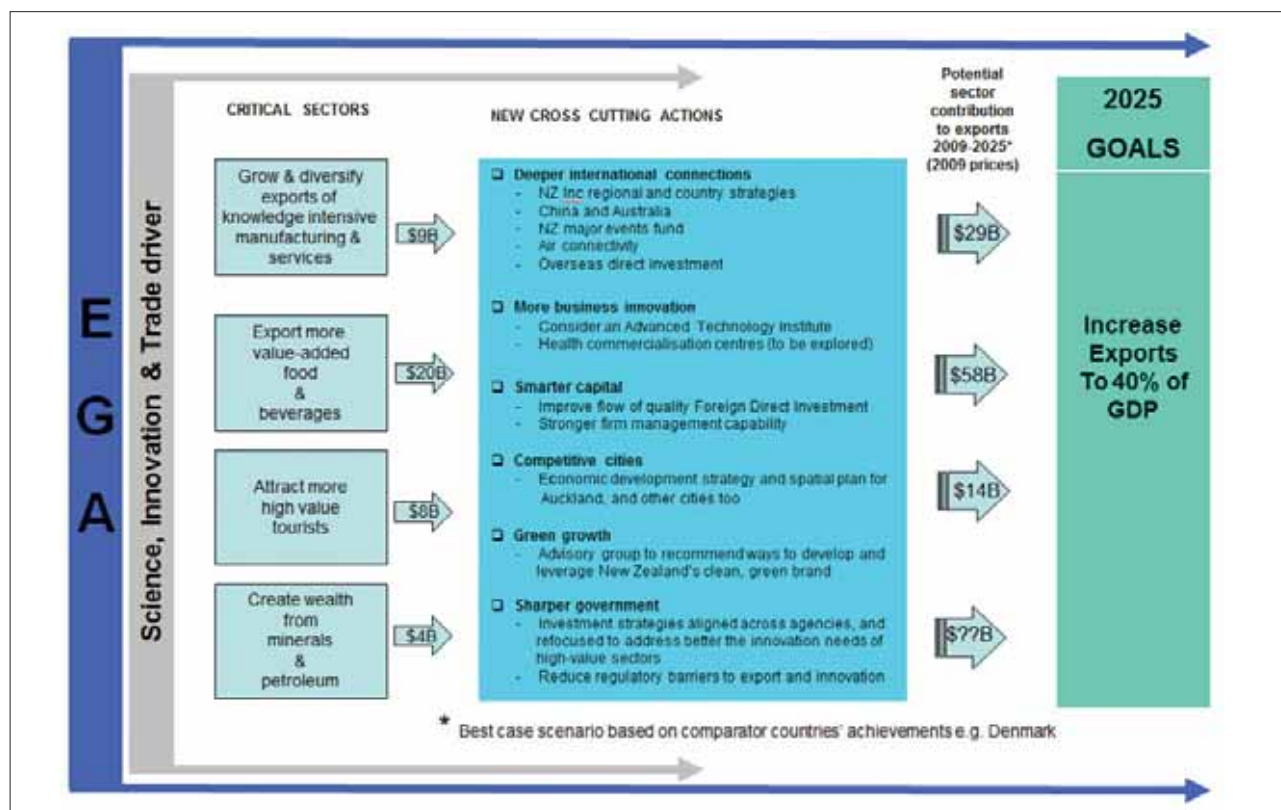


Figure 2: Summary of the Government’s Economic Growth Agenda, taken from the Economic Development Portfolio Briefing for the Incoming Minister. Note that \$ values in this figure are from 2009, so are based on 2009 \$ (NZTE personal communication).

The current Agenda calls for a near trebling of the real value of agri-food exports, from \$20 billion to \$58 billion and the briefing for the incoming minister for the Ministry of Economic Development (December 2011) emphasises the critical role that value-added food and beverages must play if Government is to reach its 2025 economic growth goals. We note that the figure of \$58 billion is in 2009 dollars, and this equates to \$62 billion in 2011 dollars, which are used elsewhere throughout this report.²

To achieve the proposed target a compound annual growth rate (CAGR) of around 7% will be required.

The growth rate observed from 1985-2011 gives a CAGR of around 3% (shown from 1995 in Figure 3). MSI data, presented to The Plant Market Access Council in October 2011, show that published agri-food business strategies predict total growth in exports of \$14–18 billion (2010 dollars) by 2025, about 4% CAGR. The result is a gap of about 3% (CAGR) growth required in addition to business as usual growth. Closing that 3% gap is the focus of this report. (See Figure 3).

Sales of an additional \$40 billion per annum will require substantial extra capital investment. Coriolis, in proposing [3] that a path forward for New Zealand was

² All dollar values in this report, except where otherwise indicated, are based on 2011 dollars and adjusted using the June quarter consumer price index for that year.

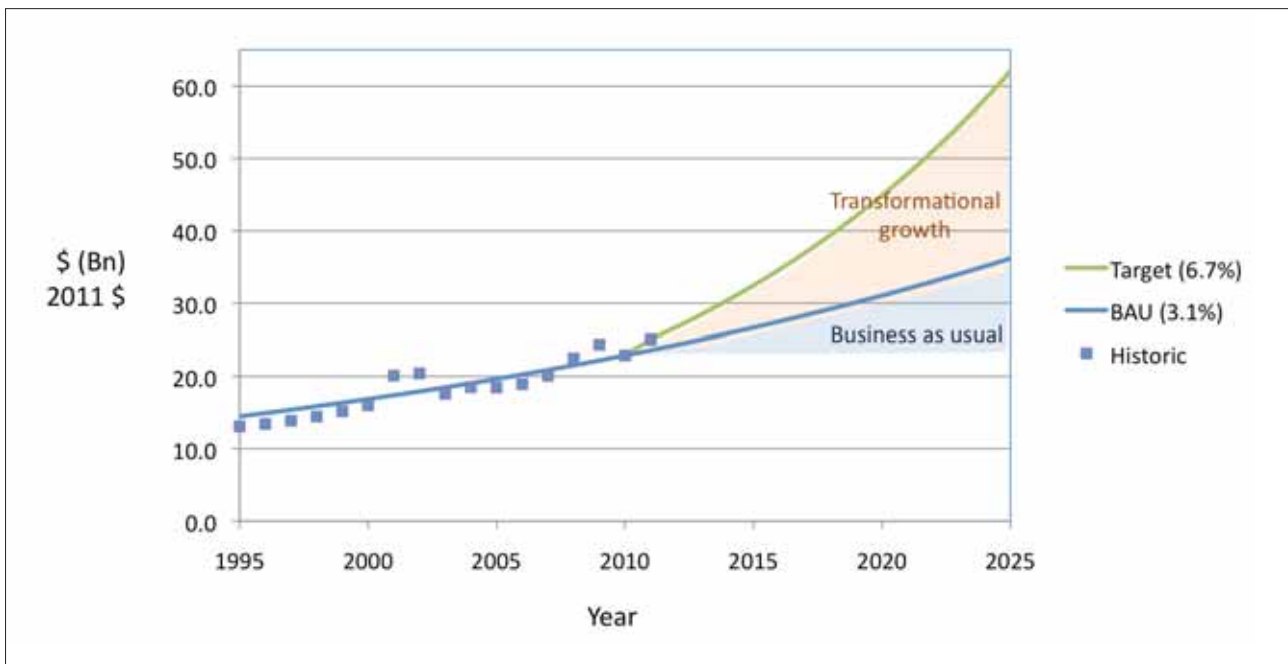


Figure 3: Agri-food exports: historical growth and projections (CAGR 3.1%) and target growth (CAGR 6.7%) to 2025. All amounts are expressed in 2011 dollars based on the Consumer Price Index (CPI) of the June quarter of that year. CAGR = Compound annual growth rate.

to transition from ingredients into packaged/processed foods, warned that this will require firms to make large new investments in research, plant and equipment, sales and marketing. Coriolis stated that this would conceptually require something approaching a tripling of the amount of capital in the agri-foods industry. We estimate that this implies an average new investment of about \$1.5 billion per year for the next 13 years.

Adding to the challenge, the accelerated growth must be achieved despite volatile economic factors and changing consumer demands; and in the context of substantial global change. The agri-food industry contends with rising and volatile energy costs and tighter obligations to reduce atmospheric, river and ocean pollution. New Zealand producers may benefit from population growth, the rise of the middle classes in emerging economies and

even from the disruptive effects of climate change and water shortages elsewhere.

For the last decade real food prices have risen strongly and that growth contribution is included in the around 3% business as usual trend. Further real food price increases are possible given the growth of middle classes in developing countries, expected energy cost increases and effects of climate change. However the current global economic difficulties have slowed growth recently and will make it more difficult to lift agri-food revenues if they persist.

Despite these uncertainties, the agri-food industry must make every effort to accelerate the agri-food export growth rate.

The agri-food sector has developed as a cornerstone of New Zealand's economy by capitalising on its natural advantages in agricultural production, including a temperate climate, ample water, fertile soils, large sea resource, an environment that is the envy of many, stable politics and a history of innovation.

Agriculture directly accounts for around 5% of GDP (2011), and the processing of primary food products accounts for around a further 4%.³ Downstream activities, including transportation, rural financing and retailing related to agricultural production, also make important contributions to GDP.

Agri-foods has been New Zealand's largest single export sector for the last 100 years [4]. The sector now accounts for:

- Exports of NZ\$24 billion net;⁴
- 10.4% of total New Zealand employment;³
- About two-thirds of New Zealand's merchandise export earnings;⁴
- Over half of manufacturing [5];
- About 2.5% of global trade in foods and beverages.

Agri-food has developed an internationally competitive position. Parts of the agri-food sector (such as dairy, lamb, kiwifruit, game meat and carrot and radish seeds) dominate international trade in their sectors although they are small in global production terms (see appendix 2). New Zealand cannot aspire to feed the world: we specialise in protein foods, but produce only enough protein to feed about 45 million people (appendix 2), or enough total calories to feed about 20 million.⁵ Our production needs to be carefully targeted.

New Zealand agri-food's global competitiveness reflects high production efficiencies and is built on its international reputation as a supplier of foods, beverages and ingredients with consistently high standards of taste, nutrition and safety, coupled with its good reputation for animal welfare and a clean, green environment.

As a significant contributor to the New Zealand economy, the agri-food sector is critical to our country's economic performance. This will remain so into the future. Any change in agri-foods' performance will materially and directly impact on the national economy.

Within the context of a growing world population (forecast to increase from the current 7 billion to 8 billion

in 2025 and 9.3 billion in 2050 [6]), increasing personal wealth, particularly in the developing countries of Asia and elsewhere (see appendix 3), and the increasing demand for protein, New Zealand has the potential to create valuable new assets as it serves to address these emerging markets.

PREVIOUS REPORTS

There has been a plethora of reports concerning the state of the agri-food industry, both in New Zealand and overseas. While many of these provide an overview and diagnosis of the agri-food industry, few provide answers that have led to effective action for New Zealand. A review of these reports is given in appendix 4, and a selection of the most important reports that have informed our views is listed in appendix 5.

Our assessment is that many of the sound recommendations made have not yet been implemented successfully. To understand why, we asked leading industry people to tell us what they think are the obstacles to effective implementation. Their feedback is summarised in the following paragraphs.

A strong case was made that the reports (and New Zealanders) focus on big ideas and actions required, but not on the capabilities and processes needed to achieve these actions. Capability is needed to implement the recommendations: "stop focusing on the what and focus on the how".

The most frequent response was that industry did not step up to provide the leadership and develop a coalition of the willing to advance the recommended actions. Everyone understands the issues but industry participants appear to be unwilling to take on the necessary leadership roles.

Too often, New Zealanders wait for Government to take the lead. Many of the recommendations made in previous reports are outside the role of Government, yet the "captains of industry" have not stepped up to take the leadership roles to build the required consensus. Consensus is hard to achieve despite general agreement on what needs to be done. What is needed is commitment to the common parts of the required strategies,

3 Statistics New Zealand and MAF calculations.

4 Statistics New Zealand Infoshare. www.stats.govt.nz/infoshare. Accessed 2011.

5 AgResearch, personal communication.

agreement on the action plan and a willingness to provide the resources to achieve the outcomes.

Public and private partnerships are having an increasing, positive influence and there is a growing number of exemplars of what success can be achieved by different approaches to the market. It is time to take advantage of these positive movements. The change will take patience, and confidence that success is possible. Leadership and self-belief will show that New Zealand is capable of creating the wealth we aspire to.

Many previous reports recommend a peak body to drive growth in the agri-food sector. The feedback suggested the concept of a peak body engendered polarised and ambivalent views, accentuated by:

- No consensus around the peak body's role, authority, accountability, resourcing, actions, etc. The proposed peak body had no teeth.
- New Zealand is characterised by a small number of very large firms and a large number of small and medium sized enterprises (SMEs), with few medium sized ones. The large companies do not need a peak body and are not incentivised to help the smaller companies. It is not easy for the SMEs to engage with each other or with large companies. Some industries (e.g. meat, dairy, horticulture, seafood) have peak bodies which they have a hard enough job managing without enlarging the church to include other sectors.
- There is not only competition between supply chains but also within supply chains resulting from a fragmented, highly protective and internally competitive ecosystem without a common focus.
- Fear of any advantages being frittered away by free riders.
- Government's part of the system (CRIs, ministries, universities) is designed in a way that is not conducive to co-ordinated effort, leading to piecemeal and spasmodic responses. Fixing this is part of the rationale for the formation of the Ministry of Business, Innovation and Employment.

Short electoral cycles and political changes affecting economic development activities were seen as strong inhibitors to the progress needed, a situation which could be addressed by a strong peak body less affected by these changes.

Few businesses are aware of the details of the Economic Growth Agenda and many perceive that New Zealand does not have a long-term economic strategy for growth.

The recent commodity boom mitigated any sense of crisis that might have driven a wider adoption of the recommendations of recent reports, even though it is well known that bust will surely follow and New Zealand must insulate itself from these vagaries of the commodity market.

Despite the lack of successful implementation of many of the recommendations in the reports that were reviewed, there is a general view that the various reports had had quite a significant influence, even if this was in ways that cannot be directly attributed to the report findings. Changes, both tangible and intangible, have occurred. In the 1990s too many, particularly

in Government, saw the primary sector as a sunset industry. Now there is a clear recognition that agri-foods have a vital role to play in increasing New Zealand's wealth. The reports have influenced policy and action.

GOVERNMENT'S SUPPORTING ACTIONS

Government has taken many effective steps in the last few years that will contribute to accelerating growth of the agri-food sector:

Leadership

- A Chief Science Advisor to the Prime Minister was appointed.
- The Foundation and the Ministry of Research, Science and Technology were merged and, subsequently, the Ministry of Business, Innovation and Employment was established; and the Ministry for Primary Industries incorporating agriculture, forestry, fisheries, biosecurity and the food safety authority was formed.

This "more joined-up Government" approach and actions within these two ministries to co-operate on policy and practice are welcomed.

- Both the CRI Taskforce [7] and the High Value Manufacturing and Services Sector [8] reviews recommended some much needed reforms, many of which have been actioned.
- Kiwi Innovation Network (KiwiNet), a consortium of universities and crown research institutes, was established to facilitate working together to increase the scale and the impact of scientific- and technology-based innovation in New Zealand.

Consumer-driven export marketing

- The Primary Growth Partnership (PGP) was set up. This is a Government-industry partnership that invests in significant programmes of research and innovation to boost the economic growth and sustainability of New Zealand's primary, forestry and food sectors. The Government has allocated a budget of \$70m per year, a major investment. This is encouraging (de-risking) agri-food companies (frequently in partnerships) to invest across the value chain to build systems that will underpin added value, sustainability and competitiveness. To date Government investment of \$174m in seven large programmes has generated co-investment by the agri-food private sector of \$214m. We welcome this unique (for New Zealand) approach.
- A report [9] was published by the Government commissioned Green Growth Advisory Group. This is targeted at bringing together policies that will help New Zealand build a more productive and competitive economy while meeting environmental objectives.

Sustainability

- A national policy statement was issued [10] requiring regional councils to set limits on water takes and water quality.
- The Land and Water Forum [11], an example of an effective industry, NGO, and Government partnership, was established.
- A Biosecurity Science Strategy [12] was issued, and a Joint Border Management System, developed by Customs and MAF, set up.
- Funding of \$45 million over 4 years was provided for the Global Research Alliance on Agricultural Greenhouse Gases.
- The New Zealand Greenhouse Gas Research Centre (\$4.85 million/annum) was opened.

Capability and skills

- The Food and Beverage Information Project [13] is a comprehensive overview of New Zealand's food and beverage industry and provides invaluable information on the growth and exports of the industry.
- Budget 2012 announced \$385m, over 4 years, for investment in science, innovation and research, including funding for an Advanced Technology Institute, support for a series of National Science Challenges⁶, a boost in funding for science and engineering courses in tertiary education and an increase in the Performance-Based Research Fund.
- New Zealand Trade and Enterprise is funding a Global Agribusiness Project conducted by PriceWaterhouseCoopers, looking in depth at outward direct investment by New Zealand companies.
- A recent outcome from the Dairy PGP funded programme was the launch of the Primary Industry Capability Alliance (PICA)⁷ with a mission to provide and promote integrated career and development pathways that build the technical, commercial and people management capability of the pastoral industry.

Investment in innovation, research, development and extension

- New funding mechanisms to encourage R&D are in place (science vouchers; technology development

grants; undergraduate and postgraduate internships; innovation entrepreneurs programme, etc.⁸).

- A Centre of Research Excellence (CoRE) (the Riddet Institute, devoted to innovation in foods, has been established (2007)). The CoRE funding allows on-going fundamental and strategic research in foods.
- The New Zealand Food Innovation Network (NZFIN) [14, 15] is a national network of science and technology small and pilot-scale resources, and has received Government funding of \$21 million. It was created to support the growth and development of New Zealand food businesses of all sizes by providing facilities and the expertise needed to develop new products from ideas to commercial successes. The organisation is providing open access pilot plant facilities that will assist even the smallest of food companies to develop competitive export products. These facilities provide an incubator where food manufacturers can test their ideas and that will allow them to produce products on a small scale for market evaluation. The NZFIN facilities are particularly focused on lowering the costs and risks of innovation for small and medium enterprises. Significantly, MPI has worked with NZFIN to ensure that the products are fit for purpose and can comply with export/import requirements. NZFIN is a critical piece of infrastructure to support the increase in innovation, facilitating technology transfer and training and a focal point to enable agri-food companies to develop their capabilities. We encourage agri-food companies to make effective use of these new facilities.

SWOT ANALYSIS

A foresighting session involving a range of industry stakeholders was carried out in 2011 to gain a view of what the future New Zealand agri-food industry might look like (a full report is given in appendix 6). The conclusions helped form an important framework to understand how factors affecting the industry today might play out in the future.

We used this framework, our review of published reports and the consultations with industry leaders as inputs to a SWOT analysis for this project.

The conclusions of the SWOT analysis are presented below and the full analysis is given in appendix 7.

6 It is interesting to note that the three examples provided by the Prime Minister, Rt. Hon. John Key, of the types of questions that might be suitable for funding under the national science challenge are all relevant to this report:

How could New Zealand intensify its primary industries in an environmentally sustainable way – increasing production while at the same time protecting the environment, particularly water quality?

What cost-effective technologies could be developed for sustainable energy production through use of biomass (plant material or agricultural waste) or advanced geothermal technologies?

How could New Zealand produce a new generation of high-value foods – for example food or food-derived products that have demonstrated health benefits, designed for the Asian market?

7 <http://www.pica.org.nz/>

8 <http://www.msi.govt.nz/get-funded/fund-finder/>

STRENGTHS

Favourable geography and climate
Adequate water – but need to manage it more effectively
Efficient farming and processing
Disease-free status on farms and effective biosecurity
Reputation for quality, safe food in traditional markets
Global food producer
Good R&D capability
Good positioning in traditional markets
Capability in food production & processing
Intellectual capital in production & processing of food
Government support of the agri-food export industry

WEAKNESSES

Distance from markets - both physical and psychological
Lack of understanding of and connection to consumers and their changing needs in markets, coupled with a lack of consumer intimacy – particularly in emerging markets (E7 countries)
Fragmentation within and between sectors and Government, and along the value chain. Government agencies are fragmented too
Low levels of investment in R&D by industry
Failure to embrace new technologies such as GMO food crops and irradiation of food
Need for more capability
Lack of capital
Low level of overseas direct investment
Dominance of a small number of large firms and an absence of mid-sized firms
Few New Zealand businesses involved in international business

OPPORTUNITIES

Emerging economies - especially the E7 group
Potential for growth
Increased awareness of the role of food in health
Potential to capture more revenue and profit from the value chain
Potential to better meet consumers' needs through a better understanding of their requirements
Digital and new wave communication including social media allows direct interaction with consumers
Increasing urbanisation in target markets creates a demand for “fresh” foods with enhanced shelf life.
Emerging technologies increase the potential for “fresh” foods to distant markets
Opportunities to decrease inputs
Māori agri-food economy
Changing consumer needs
Processed foods
Global growth in food service
Increasing demands by overseas consumers for environmental sustainability and animal welfare – New Zealand has credibility

THREATS

High and volatile foreign exchange rate
Increasing cost and price instability of petrochemical energy
Increasing local production in target markets – particularly important with respect to China
Reducing demand for meat and dairy products in traditional markets because of perceived health and environmental concerns
Agri-food competitors – other countries with similar climates, larger land areas and cheaper input costs
Biosecurity risks
The brain drain
Increasing cost of regulatory compliance
Proliferation of non-tariff trade barriers – by large retailers and some Governments
Fertiliser use – particularly dependence on imported phosphate, the supply of which is reducing
Loss of production base to urban sprawl
Free trade agreements that could impose commercial regulations detrimental to a “NZ Inc.” approach

There are many worthwhile strengths and opportunities to lift the output and profitability of agri-foods. Those strengths and opportunities provide the foundation for success of the strategies proposed in this document. We note specific opportunities based on processed/packaged foods and the Māori economy (see appendix 8).

Most of the threats are from external factors which are largely beyond the control of agri-food sector participants. The response should be to have well-prepared risk management strategies.

The weaknesses we have identified are important. The strategies in the next chapter and the contributions by Government will need to be implemented effectively to address these weaknesses. However, the weaknesses indicate a lack of readiness, and capability, of industry to

leverage Government's contribution and make the most of the opportunities available.

Remedying the weaknesses will require increased investment in the capability of the agri-foods sector to grow profitable businesses. Almost all of the weaknesses can be reduced through increased capability and industry efforts in partnership with Government. Overcoming the weaknesses identified is, in our opinion, the best way to accelerate the growth of the agri-foods sector to reach its potential and achieve Government's targets.

An important weakness that must be addressed is a failure to properly appraise new technologies, such as genetically modified crops and irradiation, with due regard to sustainability.

“APPRAISING NEW TECHNOLOGIES IN THE FOOD SYSTEM

- *New technologies (such as the genetic modification of living organisms and the use of cloned livestock and nanotechnology) should not be excluded a priori on ethical or moral grounds, though there is a need to respect the views of people who take a contrary view.*
- *Investment in research on modern technologies is essential in light of the magnitude of the challenges for food security in the coming decades.*
- *The human and environmental safety of any new technology needs to be rigorously established before its deployment, with open and transparent decision-making*
- *Decisions about the acceptability of new technologies need to be made in the context of competing risks (rather than by simplistic versions of the precautionary principle); the potential costs of not utilising new technology must be taken into account.*
- *New technologies may alter the relationship between commercial interests and food producers, and this should be taken into account when designing governance of the food system.*
- *There are multiple approaches to addressing food security, and much can be done today with existing knowledge. Research portfolios need to include all areas of science and technology that can make a valuable impact – any claims that a single or particular new technology is a panacea are foolish.*
- *Appropriate new technology has the potential to be very valuable for the poorest people in low-income countries. It is important to incorporate possible beneficiaries in decision-making at all stages of the development process.”*

Source: The Future of Food and Farming: *Challenges and Choices for Global Sustainability. Final Project Report.* Foresight. UK Government Office for Science, London, 2011, p. 11. <http://www.bis.gov.uk/assets/foresight/docs/food-and-farming/11-547-future-of-food-and-farming-summary>.

STRATEGIES AND ENABLERS TO ACCELERATE GROWTH OF AGRI-FOODS

Many strategies to accelerate the growth of agri-foods exports have been proposed.

The next chapter summarises these strategies into four product-market “transformational strategies”. They specify where profitable growth will be achieved for the agri-foods sector.

It is not enough to specify targets and strategies that we would like to see implemented. Sector leaders must also ensure the agri-foods sector has the capability and capacity to implement the strategies successfully.

Accelerating the growth materially will depend on effective implementation of the transformational strategies. Chapter 5 discusses four “enablers” we have identified that offer the potential to accelerate and otherwise improve implementation of these transformational strategies. In the following section, these enablers are indicated in **bold**.

The strategies we have identified fit into four general, interacting categories that we have labelled transformational strategies. We endorse efforts to progress all four of the transformational strategies.

TRANSFORMATIONAL STRATEGIES

- 1. Selectively and profitably increase the quantities and sales of the current range of agri-food products.**
- 2. Profitably produce and market new, innovative, high value food and beverage products.**
- 3. Develop value chains that enhance the integrity, value and delivery of New Zealand products and increase profits to producers, processors and exporters.**
- 4. Become world leaders in sustainability and product integrity.**

Strategy 1 is a continuation of business as usual. Based on past performance, Strategy 1 is expected to contribute a growth rate of about 3%. We estimate the effects of published strategies from various sectors increase this CAGR by about 1%.

Strategies 2 and 3 are needed to contribute the remaining 3% required to reach the 2025 target. Both these strategies will require increased effort and capital. They will require the development and deployment of new capabilities to meet potential.

Strategy 4 is essential to meet customer requirements and to allow retention of the right to farm and process in the future. There are price premiums available for sustainability and product integrity already and these may grow in the future.

None of these strategies is new – all have been raised in one or more previous reports. They are all critically important and complement one another, but they have not yet been adequately acted on to achieve the level of growth targeted for the sector.

The targets are expressed as revenue goals but it is important to recognise that volume alone is not the purpose of the strategies. The focus on growing customer value thus enabling higher prices, and reducing costs, will together contribute to larger margins and so to more profits for sector businesses. Lower costs may allow lower prices which may make it possible to compete in markets which are otherwise inaccessible.

STRATEGY 1: SELECTIVELY AND PROFITABLY INCREASE THE QUANTITIES AND SALES OF THE CURRENT RANGE OF AGRI-FOOD PRODUCTS

- Through optimisation of land and sea use, with improved technology of production and efficiencies in manufacture.
- Through targeted use of overseas resources and land.

This strategy is about further increasing production and production efficiencies to get the best economic return from our competitive advantage. It is the strategy that is being done the best at present and largely forms the basis for current sector strategies. The contribution of the onshore part of this strategy is built into the “business as usual” projections and will contribute much of the ongoing 3% growth.

Key elements of this strategy are improved on-farm efficiencies driven off genetic gain of productive species, improved management practices, optimisation of land use, up-skilling of producers and sustainable intensification. It includes technology developments in aquaculture, irrigation, precision agriculture and waste minimisation.

Wider adoption of best practice in farming will increase production and improve productivity. It has been estimated that by improving the productivity of dairy farms that perform below the average to the performance

of the average, overall production would increase by 25%.⁹ Extrapolation of the results from an Australian study [16] to the New Zealand context suggests an annual profitability benefit from the higher education of farmers of \$65,000 per farm, with at least \$20,000 attributable to an improvement in business management.⁹

The briefing to the Incoming Minister from MAF¹⁰ stated that lifting the average performance of pastoral farmers to that of the top 25% would increase exports by \$3 billion annually and this is just using existing knowledge and resources. A BERL analysis [17] concluded that sustained investment in pasture renewal has the potential to increase the farm gate value of pastoral products from the existing \$16 billion per annum to \$19 billion per annum.

Some of the production from this adoption of best practice will be what is traditionally known as commodities, and it must be recognised that growers and processors can make significant profits by increasing efficiency and managing the supply chain to capture the maximum benefit from these commodities. Having a stable base in commodity exporting provides a competitive feedstock for value-added activities and provides the distribution network that offers a platform for new innovative products as well as the ability to absorb risk if new products fail, as some will.

Further research is needed to determine the costs and benefits of intensification of farming after accounting for natural capital and environmental services consequences, and to identify practical ways of further increasing sustainability. Adoption of best practice in controlling adverse impacts on the environment is an essential component of intensification. Recent reports from New Zealand and the USA have shown that greenhouse gas emissions/kg milk solids, in general, decrease with increasing milk solids production per cow and per hectare, and with increasing profitability per hectare [18, 19].

The strategy will also require increased efficiency in our manufacturing industries, particularly with a view to

minimising losses and maximising use of by-products.

The effectiveness of actions to implement this strategy will be increased by **Investment in Innovation, Research, Development and Extension** and up-skilling of farming personnel through Investment in **Capability and Skills**.

New Zealand also has the potential to build on its capabilities in logistics, light manufacturing and information technology, leveraging off excellence in innovation in primary production and food and beverage manufacturing, for example in stainless steel fabrication, precision agriculture, electric fencing, milking technologies and analytical and auditing services.

It is important to recognise that this strategy aims to deploy agri-food resources to maximise returns to New Zealand rather than contributing to international food security by maximising calorific or protein production. New Zealand's relatively limited land and sea area means that New Zealand agriculture cannot make a significant contribution to feeding people in developing countries or providing global food security (see appendix 2).

However, New Zealand, as a world leader in agricultural production systems and processing, can, and should help other countries improve their agri-businesses so that they can feed their people and increase food security. New Zealand should leverage its intellectual capital offshore in ways that bring benefits to New Zealand and other countries.

New Zealand's land-based production system is limited by the amount of land available. A further option to increase production is to develop production and processing overseas. Fonterra (in China and Brazil) and ZESPRI (in Italy, France, Chile, Japan, South Korea and Australia) are notable examples.

The revenues from these activities will not be included in export statistics for New Zealand but the profits earned, capabilities developed and connections established will contribute to economic success.

“NZ, both in agriculture and non-agriculture, has a generally poor record of investing overseas, although there are some stand-out successes. All I am saying is the following:

- We have vast wealth locked up in our Intellectual Property in dairying – and not just at the production, or ‘gumboot’ level.*
- As consumption of dairy grows, we will be able to increase our exports, but there is no possibility of our feeding the Asian middle class: production will soar in some of these markets.*

At the very least, we should aim to be part of that growth.”

Hon Tim Groser.

Source: www.national.org.nz/Article.aspx?articleId=35614.

⁹ Source: DairyNZ.

¹⁰ We note that in 2012 MAF was launched as the Ministry of Primary Industries (MPI). We have used the name MAF where it occurs in an historic context, otherwise MPI.

The value to New Zealand of such activities will be enhanced if the products are supported by New Zealand management systems and branding, providing the cachet of reliability, safety and quality.

Leveraging New Zealand's opportunities offshore will require additional trained personnel and will be enabled by further investment in capability and skills.

This strategy will provide the "business as usual" part of the target, but has the potential to contribute more.

STRATEGY 2: TO PROFITABLY PRODUCE AND MARKET NEW, INNOVATIVE, HIGH VALUE FOOD AND BEVERAGE PRODUCTS

- Through directly transacting with end users or as close as New Zealand suppliers can get to them.
- Through using new science and technologies, particularly in the processing of foods and beverages and in the health and wellness arena.
- Through targeting affluent markets, particularly the places where affluent people shop, such as Waitrose, Whole Foods and Carrefour, and fine dining establishments in Beijing, Shanghai and Singapore. The volume of our exports in most sectors is so small that we estimate that all New Zealand would need is 20 great retail relationships to transform the whole industry. A good example is the role of retail chains in the United Kingdom in the early development of the New Zealand wine industry. Government's

role in negotiating free trade agreements and Government-to-business relationships remains a vital contributor to this goal.

- Through market analysis, particularly in Asia and South America, and eventually in India, and through understanding of consumers and their needs.
- Through increased investment into the development of smart ingredients.

This strategy is to develop new products to meet changing consumer needs in both traditional and emerging markets, particularly the drive towards health and wellness through diet, and the desire for "fresh" characteristics of food. This may be more pertinent to the emerging markets in Asia and South America for some opportunities because they are not as distant as New Zealand's traditional markets.

Recent improved market access to China and South East Asia has sharply increased prospects for New Zealand food exports. However, the current product forms are largely bulk commodities, whereas higher value exports can be inhibited by behind-the-border regulations and behaviour. Such restrictions will act as major constraints to developing value-added opportunities unless a "NZ Inc." strategy is carefully developed, involving businesses and Government working together in a business-like manner.

This strategy will be built on **Strong Consumer-driven Export Marketing** leveraging off substantial **Investment in Innovation, Research, Development and Extension**, to develop in-depth understanding of consumer needs and to develop new market-ready superior quality products to meet those needs. It will target both

"Imagine an alternative reality where New Zealand was colonised not by England but rather Japan or China. In this reality, New Zealand would produce very different foods and beverages. This is what the future potentially looks like".
Source: Coriolis. www.med.govt.nz/sectors-industries/food-beverage/pdf-docs-library/information-project/markets-global-2011.pdf, p. 11.



Photograph courtesy of Prof David Hughes.

high value and high value-added (with added costs that are less than added price or value) products and services.

“Consumer-driven” includes branded products on the supermarket shelf as well as ingredients (also preferably branded) that may be incorporated by others in their branded products. Examples of the latter include whey protein concentrates from Fonterra incorporated in branded sports or health drinks and the probiotic, DR20, incorporated by Danone into yoghurts.

“Market-ready products” could include products manufactured in the market by New Zealand companies, using New Zealand ingredients, and possibly using innovative processing technologies to both shorten the supply chain and overcome the distance to market for “fresh” products. For example, Fonterra supplies ingredients that are recombined in the market in Mexico to provide a fresh cheese to consumers.

The strategy will require significant **Investment in Capability and Skills** to develop the expertise to understand consumer needs and develop the products, and to develop the entrepreneurial and business skills to successfully produce and market these new products. Critical to this strategy is an overt “NZ Inc.” approach to the market, which will require **Industry and Government Leadership** and discipline.

This strategy contributes to the transformational part of the target.

STRATEGY 3: DEVELOP VALUE CHAINS THAT ENHANCE THE INTEGRITY, VALUE AND DELIVERY OF NEW ZEALAND PRODUCTS AND INCREASE PROFITS TO PRODUCERS, PROCESSORS AND EXPORTERS

- Through new understanding of and connection with consumers and customers.
- Through enhanced business and logistics connections, demonstrating co-operation and collaboration.

Strategy three complements strategy two, but is particularly focused on emerging markets and emerging segments in existing markets. It is much easier to build downstream positions in value chains while they are being established. Once the industry structure is mature, it becomes much more difficult to enter. This strategy must also address new paradigms for doing business: the internet and the widespread use of smart phones, particularly in emerging economies, means that new supply channels are being developed that bypass traditional retail distribution and allow the consumer a much greater level of intimacy with the producer.

New Zealand must strive to control more of the profitable parts of the value chain from “soil to wellness”.

The value that potentially can be unlocked from the value chain is illustrated in the following diagram from the Industry Snapshot produced by the Coriolis Food and Beverage Information Project for MED.

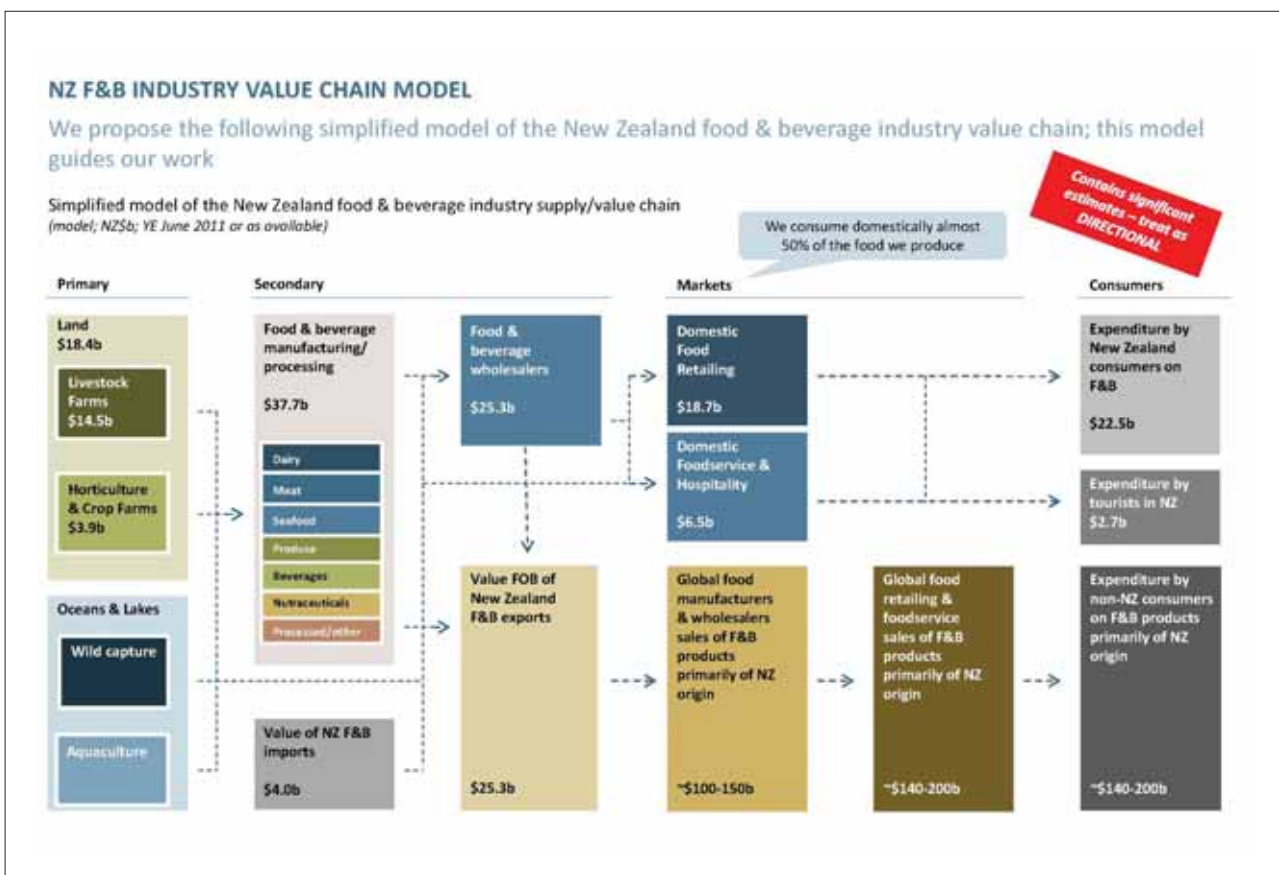


Figure 4: Industry value chain model, indicating values captured at each stage of the chain. From Food & Beverage Information Project 2011 Industry Snapshot Final Report p11; February 2012; www.foodandbeverage.govt.nz. Reproduced with permission from Coriolis and MED.

The diagram shows that food and beverage exports worth \$25.3 billion FOB are converted to \$140–200 billion of expenditure by overseas consumers. New Zealand businesses should find ways to capture significantly more of this 6–8 fold increase in value. Around 25% of it would increase the FOB value of New Zealand's exports to \$60 billion!

Accessing more of the value requires New Zealand firms to develop a better understanding of consumers and of the manufacturing, distribution and retailing industries that are currently capturing the majority of the value, as well as opportunities for new business models that may be appropriate in emerging economies, such as direct marketing and interaction with microbusinesses.

New Zealand's outward direct investment is small relative to that of other advanced economies. Capturing more of the margin will require investment in other profitable stages of the supply chain. Vertical integration and use of new business models to get closer to the customer can provide better information about customer needs, better coordination of product flow and more of the margin.

The value proposition for consumers of New Zealand agri-food products must include:

- Absolute food safety enforced by robust regulations;
- Security of supply;
- Traceability;
- Environmental sustainability;
- Animal welfare;
- Fair trade;

and must be supported by telling a credible "NZ Inc." story.

The roles that New Zealand's distribution chains play in determining the end format of products are often underestimated. Mastering distribution logistics is key to unlocking value from the agri-food industries. New Zealand relies too much on freezing and dehydration and on expensive airfreight. Countries like Norway with fresh seafood and the United Kingdom with fresh produce are making great inroads into extending fresh shelf life. Maersk is doing some exciting things with live seafood and chilled sea freight. New Zealand should be actively participating in developing or using these technologies.

An initial benefit from the QUESTII example is a reduced carbon footprint for New Zealand products in market. As the technology becomes more widely adopted decreases in costs of shipping can be expected (or smaller increases as energy costs rise).

The new QUESTII refrigeration management software developed by Wageningen UR and taken up by Maersk is expected to drop the Maersk fleet's CO₂ emissions by half a million tonnes a year, with commensurate cost savings for fuel. This has important implications for New Zealand's export cold chain. It has already been successfully used by Alliance Group.

Source: Food New Zealand, February/March 2012, p. 33.

The recently launched partnership between Fonterra and Silver Fern Farms, Kotahi [20] aims to bring New Zealand's exporters and importers together to match supply and demand for freight services on land and sea. It will get New Zealand products to distant markets more efficiently and lift the performance of the country's distribution chain. The partnership is a good example of "enhanced business and logistics connections". Other examples are five aquaculture companies joining forces to collaborate in marketing green-lipped mussels in China under a single brand name [21] and the proposal in the Red Meat Strategy for in-market co-ordination [22].

Emerging markets have developing value chains as the local food and beverage retailers develop their supply chains. These emerging industry structures offer greater potential for New Zealand businesses to participate in profitable sections of the downstream value chains.

New communication technologies, particularly the internet and the use of portable computers and smart phones, are changing the ways producers and manufacturers can interact with consumers, creating the possibility of direct marketing from a New Zealand base. Communications technologies are particularly an opportunity for New Zealand because they help overcome problems of distance from markets, one of our biggest weaknesses.

This strategy will be enabled by **Strong Consumer-driven Export Marketing**, leveraging off **Investment in Innovation, Research, Development and Extension**, to develop understanding of consumer needs and new ways of shopping for food. It will require **Investment in Capability and Skills** to develop the entrepreneurial and business skills to put in place new value chains and routes to market. Critical to this strategy (as for Strategy 2) is an overt "NZ Inc." approach to the market, which will require **Industry and Government Leadership**. This strategy will also require significant **Investment Capital** to support the foreign direct investment needed to develop these new opportunities in-market.

This strategy contributes to the transformational part of the target.

STRATEGY 4: TO BECOME WORLD LEADERS IN SUSTAINABILITY AND PRODUCT INTEGRITY

- To protect our natural resources and biodiversity.
- To satisfy consumer demands and maintain market access.
- To lower costs.
- To develop methods of measuring and paying for the full cost of production, including the cost of environmental services.
- To make sustainability a competitive advantage.

Among New Zealand's most valuable assets are its comparative "clean green image", its reputation for safe food, its climate and its ample water. Internationally, continuing population growth and climate change will increase pressure on water resources.

Growing sustainably is a crucial adjunct to meeting the targets. Overseas customers associate "safe" products with "clean and green" and, at home, New Zealanders expect the environment to be maintained in a manner that provides clean waterways and enhances their outdoor lifestyle.

Sustainable practices are essential to preserve the right of the agri-food sector to continue operating in New Zealand and they offer the potential to build customer preferences for New Zealand-sourced products. New Zealand must continue to build responsible growth and resilience into farm and manufacturing systems, encompassing the four values – economic, social, environmental and cultural – to formulate robust outcomes and related policies.

In the short term, some sustainability or "green" strategies will have costs, but in the longer term they will pay dividends. New Zealand needs to implement programmes in which producers are given reasonable time to make adjustments but in which penalties for non-compliance are a significant consequence.

In this respect, New Zealand needs to see the whole agri-food industry as a "commons"; a communal asset. If one player does something to damage the country's reputation for sustainability, then all players suffer from this damage. Very high levels of assurance are needed around everything that is done and programmes for continuous improvement are needed. This is also an area in which perceptions are important. It is not enough to be doing good; New Zealand agri-food enterprises also have to be seen to be doing good.

As the world "grows smaller" and climate change impacts are felt, the risks to New Zealand's biosecurity are continuing to increase. The growing number of travellers and the range of imports increase the threat of a biosecurity breach that could undermine the economic viability of a part of the agri-food sector. Protecting the biological economy from invasive pests and diseases must remain a high priority for Government and industry. *Psa (Pseudomonas syringae pv. actinidiae)* in the kiwifruit industry and OsHV-1 (*Ostreid herpesvirus-1*) in oysters are recent and vivid examples of pests that have each had a significant adverse effect on our agri-food industry. However, consideration must continue to be given to the need for innovation and the restrictions imposed by biosecurity requirements should not, for example, unnecessarily restrict the import of new plant material.

This strategy will be enabled by **Industry and Government Leadership** promoting and supporting a common approach to sustainable development; **Investment in Innovation, Research, Development and Extension** to better understand sustainability, develop sustainable options and account for natural capital and environmental services; and **Investment in Capability and Skills** to develop a workforce that can adopt and implement sustainable practices.

This is essentially a defensive strategy, which is vital for staying in business and has the potential for reducing the costs of inputs and developing customer preferences for New Zealand products by building sustainability and product integrity advantages.

We propose that four enablers be pursued:

- 1. Transformational industry and Government leadership.**
- 2. Strong consumer-driven export marketing of branded consumer and ingredient products.**
- 3. Increased capability and skills of the agri-food industry and supporting industries.**
- 4. Increased amount and effectiveness of investment in innovation, research, development and extension supporting the agri-food industry.**

Government actions so far (see chapter 3) of funding research, developing strategies, getting people and organisations working together and building capability, will make a worthwhile contribution to accelerated growth of the agri-foods sector.

However, the weaknesses identified in the SWOT analysis and the interviews and research we have done indicate that the conditions for success are not yet in place. Rapid growth will only be achieved if the strategies are implemented effectively. Agri-food industry participants need to know what to do, how to do it and to have the resources they need to do it effectively.

Implementation effectiveness depends on having strong leadership and capable actors within the agri-foods sector and ensuring that they work together well where that is required. To that end we propose that four “enablers” be pursued. The purpose of our focus on the enablers is to improve the effectiveness of the agri-foods ecosystem so that growth is accelerated as required to meet the ambitious targets set. Targets are easy. The strategies are widely understood already and are not difficult to communicate. Implementation effectiveness will make the difference between success and failure.

Our key proposal is to establish an Agri-food Board which will be the focal point for industry leaders to work together, and for industry to work with Government, overcoming barriers to implementation. We have been encouraged to set out a “straw man” that describes how to get the growth strategy implemented, the role of a peak body, and the action plan, and then find the bold leadership to drive the actions.

The enablers do not bear a one-to-one relationship to the strategies. Each of the strategies will depend on a contribution from several, if not all, of the four enablers.

These enablers focus on what can be done within the agri-foods sector to accelerate profitable growth. In the course of our work we have identified five other important success drivers that are beyond the scope of this report:

- Availability of sufficient investment capital;
- Stable, predictable exchange rates;
- Effective market access arrangements;
- Continually improving biosecurity;
- Supportive Government regulations and policy settings.

ENABLER 1: TRANSFORMATIONAL INDUSTRY AND GOVERNMENT LEADERSHIP

Effectively implementing the strategies requires transformational leadership from the agri-foods sector and Government. Revolutionary change leading to strong competitiveness in international agri-food marketing and accelerated growth will come about only when the efforts of industry participants are well co-ordinated, there is alignment across Government, and there is strong leadership and discipline from both.

- 1.1 We propose an overview group, an Agri-food Board¹¹ (industry/Government partnership) for the sector to drive collaboration in the production, manufacturing, exporting and marketing of food under a “NZ Inc.” banner [23, 24, 25, 26, 28].¹²

11 We have considered a number of ways of designating this overview group - Partnership, Alliance, Council, Peak Body etc. We have opted for Board because it denotes action, governance, oversight, etc. The name is not as important as the principle and we are sure that the coalition of the willing from industry and government will find the most appropriate name.

12 Similar boards are in place in peer countries, e.g. Denmark, Finland, Singapore and Switzerland.

AGRI-FOOD BOARD – A PROPOSED STRAW MAN

Industry leaders will form a joint industry – government partnership, an Agri-food Board, to drive the activities needed to treble the value of exports by the agri-foods sector by 2025.

The Agri-food Board will be a peak body developing national strategies, monitoring progress against the strategies and helping build the capabilities of firms and organisations to form their own strategies in the context of the “NZ Inc.” approach.

Why it is needed:

- The task to grow agri-food exports to meet the targets is complex and large. Businesses growing rapidly need knowledge, talent, capital and other resources. The Board will monitor availability of these resources and highlight where action is needed to ensure adequate supply.
- Too many NZ agri-food businesses, particularly SMEs, are currently operating independently. The Board will facilitate sharing of experiences and highlight exemplars of success to encourage learning and imitation.
- The Board will provide an opportunity to be involved in joint/pre-competitive activities including R&D, innovation, capability building and pre-competitive value chain activities.
- To facilitate collaborations between companies to develop new market or product opportunities that have a large potential to create profits for all involved.
- To promote a cultural change from rugged individualism to widespread collaboration and trust.

Purpose:

To take a holistic, whole of value chain view of the agri-food sector with a focused, centralised and co-ordinated approach to overcoming barriers to implementation of the growth strategy.

Valuable roles:

- Prioritising, promoting and monitoring implementation of the recommendations of this report and arising national agri-food strategy.
- Establishing and driving innovative growth strategies and priorities that will inform the strategies of individual companies and organisations.
- Developing and owning a “NZ Inc.” brand strategy.
- Driving collaboration in the production, manufacturing, exporting and marketing of food under the “NZ Inc.” banner.
- Providing a collective agri-food industry view into the deliberations of the Board and to Government.
- Collaborating to develop science, innovation and capability policies.
- Co-ordinating industry advice on regulations, biosecurity, animal welfare, traceability and other policy topics.
- Advising on priorities and processes for market access.
- Advising on best practice value chain integration.
- Promoting development and adoption of standards.
- Shared learnings.
- Countering misinformation.
- Self-critiquing and benchmarking.

Who:

- A coalition of willing chief executives from industry and senior Government officials. It is our hope that refinement of this proposal and formulation of the Board’s composition will be an outcome from the Primary Industries Boot Camp.
- Chaired by a highly respected industry member of the Board or an independent individual with ‘mana’ and strong governance skills.
- A designated Minister as the sponsor of the Board with authority to take Board reports and advice directly to Cabinet.
- A permanent secretariat, seed funded by a government agency and subsequently by contributions from the coalition of the willing.

The formation, role and mode of operation of the Board require further elaboration which is best left to the “coalition of the willing” from industry and Government who will come together to facilitate the growth of agri-food exports. However, the Board’s role will include the development of a national agri-food strategy and associated action plan; being an advocate for the implementation of the action plan to grow the profitability and export revenue of the agri-food sector; advising on agri-food policies and priorities in market access, science and innovation, capability growth, value chain integration and regulations; and monitoring performance. A further task will be to take an overview and align the activities of the large number of firms, agencies, constituencies and organisations, particularly in the light of the rapid rate of change required to meet the challenges.

- 1.2 Implement a leadership and capability development programme aimed at fundamentally changing the leadership aspirations, outlooks and capabilities of CEOs and their management teams so that they can lead innovative companies that are capable of achieving sustained international growth and fostering within-sector and across-sector co-operation [27].

The programme will support development in leadership for strategy, vision development, international marketing and sales, tackling challenges, international entrepreneurship, operations management, change management, human resources and branding [25].

Key targets for this programme are current chief executives and their management teams and future leaders who will be the chief executives in 2025 to 2050 [29]. It is foreseen that the programme will be repeated and become an enduring event.

We are aware that a private enterprise initiative, The New Zealand Primary Sector Boot Camp, with the aim of unlocking the global potential of the sector through collaboration and stronger strategic alignment, is underway.¹³ We strongly recommend that this be supported and encouraged. The work of this group during its boot camp could be the initiation of the Agri-food Board and the identification of its initial priorities.

ACTIONS

- The New Zealand Primary Sector Boot Camp to consider this report and the straw man on the establishment of an Agri-food Board.
- Develop and support leaders in policy making, business and technology, to increase their understanding of how to use innovation and technology to improve commercial results and

economic well-being. The first step is the New Zealand Primary Sector Boot Camp.

ENABLER 2: STRONG CONSUMER-DRIVEN EXPORT MARKETING OF BRANDED CONSUMER AND INGREDIENT PRODUCTS

An important competitive advantage enjoyed by New Zealand is its reputation in established markets for the production of safe food, underpinned by an innovative approach to food regulations. New markets will have different customers who have different needs and little, if any, awareness of New Zealand. These new markets will require new, different products and potentially new, different ways of doing business.

However, too much emphasis in New Zealand to date has been on producing high-quality commodity food and beverage products. Products must become more differentiated and therefore more valuable: the sector’s businesses need to become more customer-oriented, ensuring they understand the requirements of customers who are culturally different from New Zealanders. Some of the work to build this deeper understanding can be done co-operatively.

The main focus should be on emerging economies, particularly in the Asia-Pacific region, but attention must also be paid to traditional, high-returning markets.

The agri-food sector must increase its efforts to develop greater intimacy with consumers and enhance and leverage the “NZ Inc.” story - a clean and green country that produces safe, health-promoting, high quality food by:

- 2.1 Acquiring a deeper understanding of consumers and their changing needs, and developing strong consumer and ingredients brands through market research and consumer-focused product and marketing innovation. A key to this is direct engagement with businesses at the end of the supply chain and their customers, the shoppers and consumers.
- 2.2 Developing the “NZ Inc.” story and adhering to a national strategy to tell the story and promote the appropriate image to consumers in target markets.¹⁴
- 2.3 Repositioning New Zealand agri-food companies within the value chains in which they operate so that they secure a greater proportion of the value of the goods and services they provide. This requires understanding how the value chain works, adopting best practice, introducing new technologies and business models, and creating, not just capturing value.¹⁵
- 2.4 Ensuring the adoption of sustainable practices across the industry’s value chains, implementing effective traceability and authentication procedures, and

13 New Zealand Herald, May 28 1012. http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10808851

14 This is cited as one of the top ten challenges by NZTE in its briefing to the incoming Minister.

15 We are aware that a group of universities is hosting an initiative seeking value chain collaboration for scale, quality and positioning – we support this initiative and strongly encourage the involvement of agri-food businesses.

continuing to provide effective and efficient food safety and biosecurity regulations that are sufficiently adaptive to protect and encourage innovation but still maintain New Zealand's pest- and disease-free status.

2.5 Promoting and facilitating greater internationalisation of the New Zealand economy (outward direct investment), including joint ventures, alliances and collaborative arrangements. Such activities will lead to:

- Greater access to markets.
- Better control of distribution.
- Closer and more direct involvement with leading edge customers.
- Greater control of the raw material supply chain.
- Access to knowledge and R&D outcomes.
- Expansion and profitable use of New Zealand intellectual property (IP) and knowledge.
- Exposure to greater competition.
- Ability to benefit from local production (e.g. New Zealand farmers in Australia and South America; Fonterra farms and/or processing in South America and China; ZESPRI orchards in a number of overseas countries; Emerald Foods franchises; Comvita shops; etc.).

Success in overseas operations requires adaptation to the more difficult (compared with New Zealand) business and cultural environment in most countries – New Zealand firms need to perform better than the locals and this will require significant building of governance and management capability. Availability of sufficient capital is likely to be a significant challenge to internationalisation of New Zealand agri-food companies.

2.6 New Zealand businesses should seek to engage in a meaningful way (ideally transact directly) with customers at the end of the value chain in which they operate – e.g. with grocery or food service retailers (Sealord, Silver Fern Farms, Anzco Foods, Fonterra, ZESPRI, Comvita and New Zealand Natural are some New Zealand exemplars of this approach). Note that, for real competitive advantage, this requires such companies to provide not just products but the services required by consumers to make best use of those products. Appendix 9 provides an example of how companies need to operate in this way.

2.7 New Zealand agri-businesses should seek to become global leaders in sustainability and the management of water resources¹⁶ and, as well as using the resulting intellectual property for the benefit of New Zealand, license or sell it internationally.

ACTIONS

- Develop the “NZ Inc.” story and establish and adhere to a national strategy to tell the New Zealand story as an “umbrella statement” to support the marketing of New Zealand branded foods, beverages and ingredients.
- Develop strong brands through market research and customer-focused product and marketing innovation.
- Develop and adopt new business models and technologies to capture greater value and margins throughout the value chain, including finding ways to interact meaningfully with customers/consumers at the end of the value chain.
- Adopt new business models that seek a major increase in overseas production and processing.
- Adhere to agreed standards of value chain integrity.
- Ensure that business models are adaptive and resilient, coping well with expensive energy supplies and rapid change in export markets.
- Continue Government's active involvement in free trade agreements, Government-to-Government agreements and, especially, Government-to-business interactions. Government Ministers travelling overseas visiting major New Zealand customers, supply chain entities, supermarkets etc. would facilitate this.
- Exploit the use of internet marketing and shopping and the use of social media.
- Look for innovative ways to develop the scale needed to invest in capital plant, R&D and capacity development. For example, co-operation in marketing and technology development amongst organisations such as Ovine Automation Ltd, PGP Projects, NZFIN and the Agri-food Board, the leadership and capability development programme and the Food Industry Graduate Training Programme recommended below.
- Actively encourage multinational agri-food companies not currently in New Zealand to invest here in processing and R&D. New Zealand is an attractive destination for foreign direct investment. Already more than 40 international food and beverage manufacturers have invested in production in New Zealand and more of the large multinational companies should be encouraged to grow their presence here [30]. This will bring new talent and use New Zealand's talent, influence career paths, and enable New Zealand to take new approaches to international business.

16 Tindall S. *NZ Inc. Badly Needs a Vision*. Sunday Star Times Opinion, p. D12, 09 October 2011.

ENABLER 3: INCREASED CAPABILITY AND SKILLS OF PARTICIPANTS IN THE AGRI-FOOD SECTOR

The transformational change needed in the agri-food sector requires a significant increase in capability across the value chain. An essential component of this is the leadership development discussed in Enabler 1.

The sector must build capability and skills across the whole value chain. Producers, processors and marketers must have fully engaged work-forces, a deep understanding of consumers and their changing needs and link these understandings to business and technology development. This inevitably requires improving the quality of governance and management of agri-food enterprises and enhanced methods of technology transfer.

Twenty-four per cent of New Zealand-born highly-skilled personnel are leaving New Zealand and not returning; the comparable figure for Australia is 3% [31]. A high proportion of graduates from New Zealand universities in science and technology subjects are from overseas, and many leave after graduating. These losses lead to an impoverished resource for the industry.

One proposal to help counteract this was made by IPENZ [32]; Government should provide direct co-funding for the early years of employment of graduates in new R&D positions in industry to incentivise small private businesses to take on R&D staff, thereby having R&D expertise in-house and encouraging R&D to become part of business as usual. In part, this concept is addressed by the MSI Undergraduate and Postgraduate Internships¹⁷, although the internships are limited to only six months at half salary. That is unlikely to be long enough to embed the culture of technical support in small companies. Thought should also be given to expanding this initiative to appropriate business internships.

This capability development requires a reassessment of the curricula provided by schools, polytechnics and universities, and the training provided by such organisations as the Industry Training Organisations, Institute of Directors, Institution of Professional Engineers of New Zealand (IPENZ), New Zealand Institute of Food Science and Technology (NZIFST) etc. It would be beneficial to explore the advantages of further merging the capabilities of the Industry Training Organisations involved in the agri-food sector.

The facilities and staff of NZFIN have a critical role in growing capability in existing firms, particularly SMEs, by providing practical experience and advice to better understand the requirements for successful food and beverage development and exporting.

The United Kingdom has taken some practical steps to set up a new partnership to address the skills gap in their food and beverage industry^{18,19} and these should be reviewed to identify opportunities for New Zealand.

A key role of the Agri-food Board will be to work with the organisations involved in capability development to develop programmes that:

- 3.1 Ensure a significant increase in the attraction of school and university students into science and technology courses relevant to agri-food and ensure that many more of the top secondary school students choose science and technology at university with a view to a career in the agri-foods industry²⁰ [33, 34, 35].
- 3.2 Match the alignment of graduates from education and training courses with the capability needs of the agri-food sector. This includes improving both quality and quantity. New Zealand needs a further 400 high quality graduates in science, engineering and technology per year to meet agri-food R&D needs alone (appendix 10). It is estimated that at least twice as many graduates with appropriate qualifications are required annually over the next seven years to meet the immediate needs of the agricultural sector.²¹
- 3.3 Introduce a system of targeted full-time equivalents (EFTs) in tertiary education to stream students into the subjects that will best prepare them for the agri-food industry and ensure that infrastructure is not limiting the number of students that can be coped with, particularly in postgraduate schools (partially, but insufficiently addressed in the 2012 budget).
- 3.4 Implement a food industry graduate training programme, modelled on that operated by Fonterra and previously by the New Zealand Dairy Board (NZDB). This programme could make use of the infrastructure established for NZFIN.
- 3.5 Explore new ways to retain or recover the New Zealand graduates we are currently losing to overseas²², and to get value from connections to talent that does move offshore.

17 www.msi.govt.nz/get-funded/build-your-business/msi-postgraduate-internships-2012/

18 A new partnership between UK research bodies, universities and food companies is preparing to bridge the skills gap in the UK food industry with postgraduate training on meeting challenges posed by national and global food security. The Advanced Training Partnership (ATP) has been forged by four expert institutes: Leatherhead Food Research, Reading University, Birmingham University and Rothamsted Institute. It has been awarded £3 million by the Biotechnology and Biological Sciences Research Council (BBSRC) which, together with industry contributions, will pay for the programme of short courses for continuing professional development, Masterates and a Professional Doctorate for 5 years.

19 Food and drink manufacturers are looking for a university partner to establish the UK's first dedicated food and drink engineering degree, designed to produce graduates equipped with sector-specific engineering skills. *University Sought to Offer Food Engineering Degree*. April 2012. www.foodmanufacture.co.uk/Manufacturing/University-sought-to-offer-food-engineering-degree.

20 This could include: funding teachers to graduate with diplomas/masterates in teaching science and technology in schools; more training for school careers advisers in science and technology; scholarships for top students to attend science and technology courses at university; treble funding for the NZIFST/CREST Student Product Development Challenge and IPENZ's Futureintech.

21 Pers. comm. DairyNZ, 2012.

22 "The types of people we want in the food sector are able to work overseas in the international labour force. We need salary and conditions that will encourage them to work here. The top scholars from our schools and universities are not engaged in our biggest industry, the food sector. How do we encourage our school duxes into food technology and engineering?" Andrew Cleland, personal communication, 2011.

3.6 Make more use of overseas experts to utilise their knowledge in the development of new technologies (including more intensive interaction with the Diaspora).

ACTIONS

- Industry, universities and Government work together to improve the quality and quantity of the graduates recruited into the agri-food industry including developing greater capability to understand consumers and their changing needs, and linking that to business and technology development.
- Adjust incentives for universities to encourage them to undertake more and higher quality business-relevant strategic research and teaching, to connect with business and to provide highly skilled graduates with business-relevant skills, consistent with the agreed national and individual company/organisation agri-food strategies. Changes signalled in the 2012 Budget are a move in the right direction.
- Universities and polytechnics involved in the training of graduates for the food industry must ensure that career advisers and teachers of science and technology are well informed of the school subjects that are prerequisites for their courses. We have been informed that this is not always the case and some students are finding that they do not have the required subjects to enrol in their preferred tertiary courses.
- Develop a Food Industry Graduate Training Programme.

ENABLER 4: INCREASED AMOUNT AND EFFECTIVENESS OF INVESTMENT IN INNOVATION RESEARCH, DEVELOPMENT AND EXTENSION SUPPORTING THE AGRIFOOD INDUSTRY

R&D is a strong driver of innovation and wealth creation [36, 37, 38]. New Zealand Treasury estimated that

investment in domestic agricultural R&D has generated an annual rate of return of 17% [39]. Productivity growth has been a key factor driving agricultural output in Australia. More than two-thirds of the current real value of Australian agricultural output can be attributed to productivity growth that has occurred since the early 1950s [40, 41]. One important source of productivity growth is new technology from investment in research [42].

New Zealand has a strong and comprehensive research network but low research intensity relative to peer countries and successful international food and beverage companies (see appendix 11). Some areas of priority for research in New Zealand are outlined briefly in appendix 12.

The science system is strong at creating ideas and knowledge but there is a perception that New Zealand does not get as much value as it could from the current Government spending on R&D, although there is no reliable proof of this. Nevertheless even greater and more aligned efforts are needed by industry and Government to strengthen innovation and product development to increase value. New Zealand should strive to be a world-class integrator of knowledge leading to valuable products. New Zealand must do more research relating to agri-foods and it must do much more to turn research outcomes into successful innovation.

This will be greatly enhanced by a partnership hub, based on the Wageningen UR model (appendix 13), for research and teaching in agri-food production, processing and marketing, bringing together existing capabilities in a virtual structure, and adding new or augmented capability.

Achieving transformational growth of the agri-food sector requires both an increase in the amount spent on agri-food R&D (currently estimated at \$350 million - see appendix 11) and improvements in the effectiveness of that spend.

4.1 Increase the research intensity in agri-foods from the present \$350 million, about 0.9% of total revenue, to 2% (\$750 million) in the short term and to 3% (\$1 billion) within 5 years. Most of this increase should come from the private sector, facilitated

FOOD INDUSTRY GRADUATE TRAINING PROGRAMME

The Fonterra Graduate Technical Programme (formerly the Dairy Industry Graduate Training Programme) is a joint venture between Massey University, the New Zealand Dairy Research Institute (now part of Fonterra) and previously the NZDB. It was established in 1970 following the replacement of specific dairy technology degree programmes with a more general food technology degree, and is unique to New Zealand.

The programme provides a conversion or orientation course into the dairy industry for graduates from a variety of science, technology and engineering degrees. The trainees are all employees of Fonterra or its offshore subsidiaries. It has been highly successful, with a 75% retention rate of the graduates in the wider dairy industry for the years 1990–97. Many graduates occupy senior positions in the industry.

The programme has a committee of management representing the venture partners and the industry, an Academic Director from Massey University and an Administrator from Fonterra. It has had several reviews and continues to be highly regarded by the industry.

by Government.²³ Through the Agri-food Board, industry should define the research priorities for Government funding.

4.2 Establish a partnership hub, based on the Wageningen UR model (appendix 14) for research and teaching in agri-food production, processing and marketing, bringing together existing capabilities in a linked or collaborative governance structure, and adding new or augmented capability.

4.3 We are conscious that there has been recent, significant restructuring of the R&D sector. For this reason our emphasis is on linked or virtual centres which can be built on existing organisations. We believe that the CoREs have proved very effective in achieving critical mass and addressing unnecessary duplication. The Sustainable Land Use Research Initiative (SLURI) and the New Zealand Agricultural Greenhouse Gas Research Centre are both examples of joined-up research and together they might, for example, form the nucleus of a centre of excellence²⁴ in sustainability. Focus areas for increased R&D and co-ordination should include:

- Productivity and capacity of our production base;
- Environmental sustainability of agri-food production and processing;
- Understanding and connecting to consumers, particularly in Asia;
- The food science/human nutrition interface addressing food structuring, food processing, gastro-intestinal biology and post-prandial metabolism;
- Establishment of a strong capability to support the production of high value, clinically validated food and beverage products (consumer and ingredient) for health and wellness [43].²⁵ An essential feature of this capability will be the ability to support label claims by clinical proof of efficacy;
- New process technologies especially focused on “fresh food”;

- Support for innovation in processed/packaged foods;
- Supply chain management and integration;
- Data standards for tracking and communicating product sources, processing and quality;
- Renewable forms of energy.

4.4 Set up formal, transparent systems to assess the effectiveness of research, including not just the inputs but also the results and outcomes, and how they contributed to the \$40 billion increase goal. The outcomes should be reported publicly, at least annually. This would be a role for the Agri-food Board with input from MBIE and MPI.

4.5 Develop and increase R&D efforts working with multinational companies that locate in New Zealand.

ACTIONS

- Explore the feasibility of a partnership hub based on the Wageningen UR model.
- Identify best practice in innovation and establish mechanisms to ensure adoption by the agri-food sector.
- Build technology platforms in human health and wellness driven by foods, ingredients and beverages that have clinical proof of efficacy.
- Build capability in consumer insights, with a particular focus on emerging Asia-Pacific markets.
- Develop deeper insights into food functionality, structure, digestibility, texture and “fresh to market”.
- Establish centres of excellence in food-related technology research (particularly for processed/packaged food), on-farm systems and sustainability.
- Continue to review the national position on genetic modification.
- Ensure resource use efficiency and quality, specifically land, water, nutrients and energy, including researching methods of accounting for natural capital and environmental services.

23 The details of how Government should facilitate this increased spend by private companies requires more elaboration but could include increasing investment in Research Vouchers, Development Grants and TechNZ, including a review of the policy settings of these schemes to make them more attractive to the agri-food sector. Increased expenditure in the Primary Growth Partnership, which addresses the whole of the value chain, may also be explored. Other policy instruments such as tax deductibility of R&D and patent costs, and tax credits could also be further studied.

24 We are aware of many types of Centre of Excellence, including the New Zealand CoRE model and the Australian CRC model. The term “centre of excellence” is used generically in this document, deliberately not stating a preference for any particular model.

25 Note that New Zealand is already working in this area, as evidenced by this press announcement of 22 November 2011 – “*The EpiGen Consortium, an international alliance of the world’s leading epigenetics researchers (AgResearch Limited, Auckland UniServices Limited, Singapore Institute for Clinical Sciences of the Agency for Science, Technology and Research (A*STAR), and National University of Singapore, University of Southampton, Medical Research Council – Lifecourse Epidemiology Unit) is pleased to announce the creation of a research collaboration with Nestlé Research Centre in Switzerland*”. Such activities should be increased significantly.

The Agri-food Board should be in place by the beginning of 2013 with an active secretariat.

By the end of 2014 the Agri-food Board should have achieved at least the following:

- The Board is actively involved with industry and Government in determining priorities for the growth of agri-food exports;
- Strategies and key objectives with associated metrics are agreed;
- Systems to monitor progress towards agreed objectives are in place.

In addition, a picture of success by the end of 2014 could include:

- “NZ Inc.” overarching agri-food brand and associated standards built around “safe and sustainable” have been developed and licence uptake is surging.
- Producers of significant numbers of product groups have elected to collaborate in developing scale for their product in export markets. Exporters have formed a joint venture company to develop common value chains and marketing strategies for New Zealand agri-food products sold into rapidly-growing Asian markets.
- Two further world-leading agri-food companies are establishing processing and research facilities in New Zealand and negotiations are well advanced with three others.
- A common governance and executive structure is in place for the principal agri-food research providers (universities, CRIs and private research organisations).

- Investment in agri-food R&D by industry and Government has doubled since 2011. This has been underpinned by:
 - A centre of excellence for sustainability research being set up and funded;
 - Jointly funded centres of excellence established in the areas of value chain management, high value food and beverage products for health and wellness, sustainable agricultural intensification, fresh food processing, and renewable energy.
- A market intelligence centre has been set up in the Ministry of Business, Innovation and Employment in partnership with the agri-food industry, building on the MED Food and Beverage Information Project.
- University enrolments in science, engineering and technology have increased 30% over the last 2 years, supported by the increased profile of the agri-food sector, targeted EFTS allocations and scholarships.
- The first intake into the Food Industry Graduate Training Programme has completed its first year.
- Returning New Zealanders and migrants with relevant skills outnumber their counterparts emigrating.
- New Zealand agri-business firms have won significant new non-commodity business in China and India.
- Agri-food export returns have increased to more than \$32 billion per annum (2011 dollars) and are poised for continuing sustained and sustainable growth.

New Zealand’s agri-food export growth targets (CAGR), underpinned by acceleration of agri-food exports, need to increase from about 3% per annum to about 7% per annum. Our argument is that much more can and should be done to develop the capability of the sector and the proposed capability investment will materially accelerate export growth. Most of our proposals involve investment in organisation, knowledge and connections to enable more rapid business development.

Our vision for New Zealand’s agri-food sector in 2025 is profitable overseas earnings of \$60 billion, sustainably contributing to New Zealand’s social, environmental and economic well-being in a changing world and ensuring New Zealand continues to be a great place in which to live and pursue a career.

A lot is at stake. Growth of almost \$40 billion is targeted and only approximately half of that growth will be achieved via business as usual. Action is needed now to meet the growth targets by 2025. Industry and Government must take note of the urgency and seriousness of the situation. The largest threat is that not enough will be done to change the sector.

This is an appropriate time to implement the actions needed to gain the prize:

- New Zealand is in the middle of a fundamental transition from feeding Westerners to feeding the rapidly growing middle class population of the Asia-Pacific region [3].
- the growing middle-class markets in countries to which New Zealand has access are being targeted by other countries too and New Zealand is in danger of not gaining first-mover advantage.
- there is a consensus of views among many of New Zealand’s agri-food sector participants of the necessity for change and the issues which need to be addressed.

Strong leadership from the agri-food sector and Government is vital to bring about the change of mind-set needed to develop the new practices required to earn the prize. This should take the form of an industry-Government partnership in the form of an Agri-foods Board.

We have outlined the elements of a solution and the actions that need to be taken. These actions are not without risk. An overview of the risks that are to be considered is given in Appendix 14.

If success is to be achieved, business as usual will not be enough: it will be necessary to undertake all of these actions – it is not a list of choices but a “must do” list. It is not a list for industry or Government, but is a list for industry and Government: only with both working together in lock step will New Zealand achieve this success.

Although we believe that the agri-food industry participants must take responsibility and accountability for their own growth, Government has an essential role to play. Government must implement policies that facilitate industry efforts.

“Facilitative policies should be aimed at:

- *supporting the growth of these businesses, including ensuring they have ready access to long term capital;*
- *facilitating their access to international markets;*
- *facilitating their access to new knowledge, particularly from overseas; and*
- *keeping them centred in New Zealand until the point where they reap sufficient increasing returns from the development of related businesses and capabilities for them to choose to remain in New Zealand in substantial quantities without particular Government action.”[44]*

“Virtually every hub of cutting edge entrepreneurial activity in the world today had its origins in proactive government activity.”

Source: Lerner J. Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed – and What to Do About It. Princeton University Press, 2009.

This report is a launching pad for New Zealand’s accelerated, sustainable growth in agri-business – it is a Call to Arms.

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APPENDICES
APPENDIX 1:
THE TEAM



From left to right: Russell Ballard, Kevin Marshall, Graeme Avery, and David Johns.

Dr Kevin Marshall BE (Chem) (Hons) (Cant), MSc (Biol Eng) (Birm), PhD (Massey) (**Chair**) is an independent director and consultant in technology, research and development. He is a biotechnologist/chemical engineer with extensive experience in primary industry R&D. Current roles include: a member of the Investment Advisory Panel, Primary Growth Partnership; a director of Seafood Innovations Ltd and Androgenix Ltd; and a member of the Foundation for Arable Research Strategic Research Committee and Synlait Milk Ltd's Innovation Advisory Team. He is a reviewer for MSI research investments. He has served on ZESPRI's Innovation Advisory Board, and as a director of Plant & Food Research Ltd, Wool Equities Ltd, the New Zealand Dairy Research Institute and ViaLactia Biosciences (NZ) Ltd. He was managing director of ViaLactia Biosciences (NZ) Ltd, Group Director R&D of the New Zealand Dairy Board, Chief Executive of the New Zealand Dairy Research Institute, President of the Coordination Committee of the International Dairy Federation and Vice Chairman of the Codex Milk Committee. He is a Fellow of the New Zealand Institute of Chemistry, a Member of the Society of Chemical Engineers of New Zealand and a Fellow of the New Zealand Institute of

Food Science and Technology. In 2006, he was awarded the Institute's J C Andrews Award for Distinction in Food Science and Technology.

Dr Russell Ballard is an independent non-executive director. Among his current positions, he is Chancellor of Massey University and Chairman of the Plant Market Access Council (PMAC). He has been the Chairman of a CRI (Scion) and the CEO of five Government departments, including the Ministry of Agriculture and Fisheries and the Department of Education. He is a fellow of the Institute of Management and an accredited member of the Institute of Directors. Dr Ballard was appointed a Companion of the New Zealand Order of Merit (CNZM) in 2004.

Dr Graeme Avery has over 45 years of export market development experience – 33 years with his former international medical publishing business, Adis International, and 15 years with his new wine business, Sileni Estates. In 1963, he founded and developed Adis International Group, a highly successful international medical publishing business, which became a world leader in the creation and export of knowledge publications on new prescription drugs and their use in disease

management. The business had sales and editorial operations in ten countries.

In 1997, he established Sileni Estates, a greenfield vineyard and winery development in Hawke's Bay, which has rapidly become a producer of internationally acclaimed and awarded wines. It currently distributes its Marlborough and Hawke's Bay wines in 62 global markets and is establishing sales operations in major export markets to maximise current and new business opportunities.

In 2000, Graeme founded the Hawke's Bay Wine Country Tourism Association and the Hawke's Bay Food Group, including the highly successful Hastings Farmers' Market, which was instrumental in creating the national farmers' market movement.

Dr David Johns initially spent his career teaching and undertaking research at Massey University in the area of monogastric nutrition and completing a doctorate in Biochemistry. Following his time at Massey University he has held both Government and commercial roles in strategic research management. In Government, David worked in areas of investment and policy at both the Department of Scientific and Industrial Research and the Foundation for Research, Science and Technology. For twelve years between working for the two Government organisations David was involved in strategic research management at the New Zealand Dairy Board and Fonterra. He is currently working in investment policy for DairyNZ.

APPENDIX 2: NEW ZEALAND AS A GLOBAL FOOD PRODUCER

New Zealand is a relatively small producer of food by world standards.

Commodity	Production (tonnes)	% of World Production
Cow Milk	16,995,000	2.90
Beef	639,927	1.00
Potatoes	490,000	0.08
Sheep Meat	478,167	5.80
Barley	435,270	0.06
Wheat	403,464	0.16
Kiwifruit	390,000	28.00
Apples	357,000	0.04
Maize	237,844	0.11
Grapes	210,500	0.31
Chicken Meat	136,319	0.02
Tomatoes	92,000	0.03
Hen Eggs	54,600	0.09
Pork	46,675	0.02

Table 2.1: New Zealand's principal food exports by tonnage and by proportion of world production. Source: Dairy figures from the International Dairy Federation (2010); others from FAOStat (2009).

It produces enough calories to feed around 20 million people.²⁶ Table 2.1 shows the amounts of New Zealand's principal food exports and puts them in perspective in terms of world production.

New Zealand's predominant food product is milk; it is the 8th biggest producer in the world.

New Zealand produces enough milk to provide dairy products for 165 million people (based on an average consumption of 103 kg/year).²⁷

NEW ZEALAND AS A PROVIDER OF PROTEIN

New Zealand excels at the production of protein foods, and produces enough protein to feed 45 million people (based on a minimum requirement of 56 g/day and excluding bioavailability considerations) (Table 2.2). All the major commodities, excluding the cereals, are sources of highly nutritious and bioavailable protein.

Commodity	Protein (%)	People Whose Protein Needs Could be Supplied from this New Zealand Source (million)
Cow Milk	4	29.0
Sheep Meat	20	4.6
Beef	17	5.3
Wheat	12	2.4
Chicken Meat	21	1.4
Potatoes	2	0.5
Pork	14	0.3
Game Meat	22	0.3
Hen Eggs	12	0.3
Kiwifruit	1	0.2
TOTAL*		45.0

Table 2.2: Protein content of New Zealand's principal exports and the number of people who could be supplied at recommended daily intakes (assumes an average body weight of 70 kg). * Including other minor sources.

²⁶ AgResearch – presentation by Andy West, 2008.

²⁷ World Dairy Situation. International Dairy Federation, Brussels, 2010.

APPENDIX 3:
EMERGING ECONOMY GROWTH PREDICTIONS

RISE AND INTERCONNECTIVITY OF THE EMERGING MARKETS (SAAAME)²⁸

“Along with the growth and size of the emerging markets, it’s important to appreciate the interconnectivity of the trade and investment flows between them, which are growing much faster than the traditional routes from developed-to-emerging and developed-to-developed countries. Indeed, South America, Africa, Asia and the Middle East (SAAAME) are emerging as an increasingly interconnected trading zone, which effectively bypasses the West.”

“To make the most of the opportunities for growth, your business will need to contend with rising consumer expectations in these markets, a more complex risk environment and the growing battle for talent. As an increasing amount of emerging-to-emerging market commerce bypasses the West, Western institutions also need to find ways to tap into business flows they may never physically see.”

“The SAAAME region’s significant liquid investable capital includes a growing proportion of global assets under management (AUM) and nearly 80% of overall sovereign wealth fund AUM.”

“Our latest research anticipates that domestic credit in China could

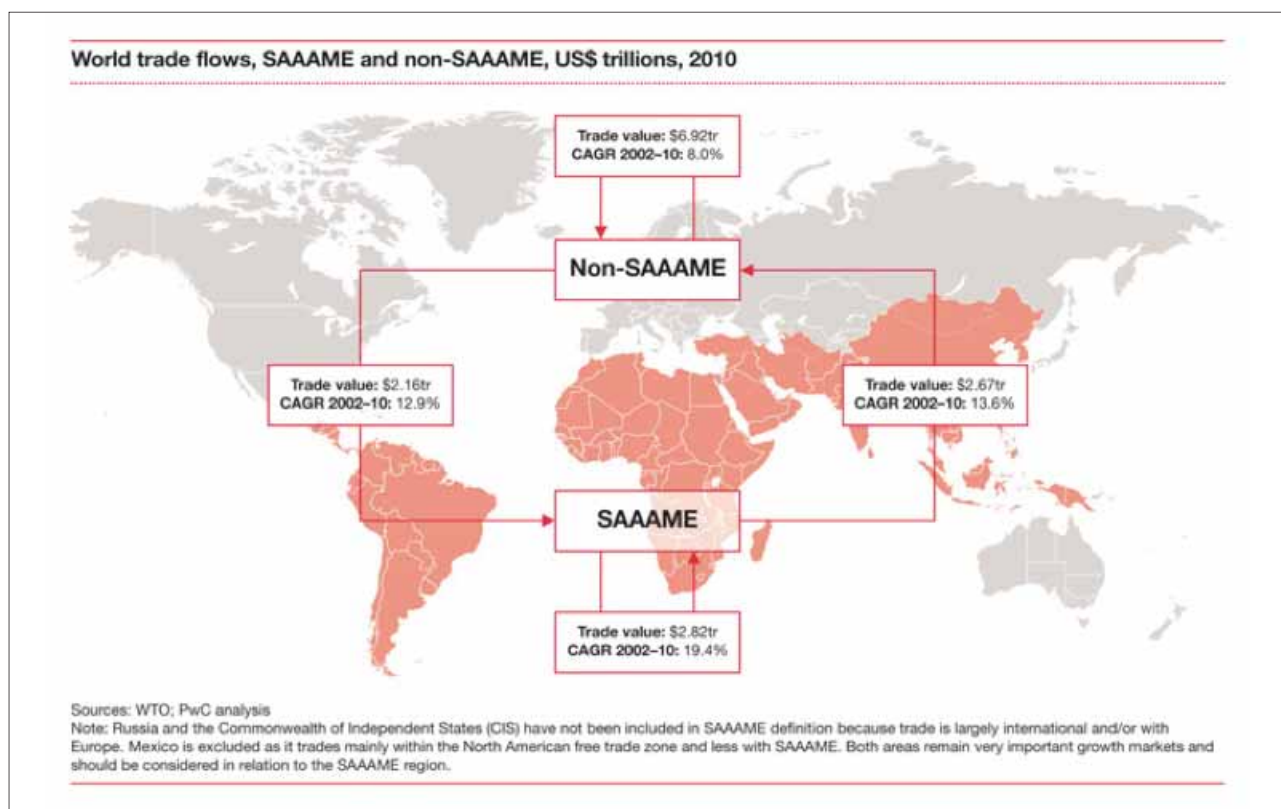
overtake the US by 2023 and India will become the third largest domestic banking sector after China and the US by 2050.”

“So what does this mean for your business?”

“The development of the SAAAME markets is leading to a radical shake-up in the growth opportunities and competitive environment for your business.”

E7

The E7 countries are a group of seven emerging economies: China, India, Brazil, Mexico, Russia, Indonesia and Turkey. These countries are predicted to have larger economies than the G7 countries by 2050.



28 *Rise and Interconnectivity of the Emerging Markets (SAAAME)*. PriceWaterhouseCoopers Report from Project Blue, January 2011. www.pwc.com/gx/en/financial-services/projectblue/rise-of-the-emerging-markets-saaame/rise-of-the-emerging-markets-saaame.jhtml

E7 GROWTH PERFORMANCE TRUMPS G7²⁹

“It is now three years since the Great Recession ended and profound changes are underway in the world economy. The global economic axis which had been shifting fundamentally away from the advanced economies of Europe and North America to the world’s emerging economies has accelerated sharply over the past four years. Moreover, living standards are rebalancing across the world, rising in the emerging countries but falling in the advanced countries.

The global economy has been severely buffeted in the past few years as it lurches from one crisis to yet another. The bursting of the US housing bubble, the meltdown of the sub-prime mortgage market, the freezing of credit markets, the collapse of Lehman Brothers, the sovereign debt crisis, credit rating downgrades, and the very survivability of the eurozone, have all contributed to the unprecedented battering that is plaguing the global economy.

It’s little wonder that the fallout from these crises has had a profound effect on the structure of the world economy. Interestingly, a comparison between the major advanced economies of the G7 and the seven largest emerging economies – the E7 – reveals some startling differences. Collectively, the E7 bloc which includes China, India, Indonesia, Brazil, Russia, Turkey and Mexico now accounts for close to 31% of world GDP, up from 19% twenty years ago. During this same time period, the G7 has seen its share of world output fall from 51% to 38%.

VITAL SIGNS: G-7 vs E-7 (Nominal GDP* 2011)			
G-7		E-7	
United States	15065	China	11316
Japan	4396	India	4470
Germany	3089	Russia	2376
United Kingdom	2254	Brazil	2309
France	2217	Mexico	1659
Italy	1829	Indonesia	1123
Canada	1391	Turkey	1055
% of World Total	38.4%		30.8%

* Purchasing power parity, billions of USD

Source: IMF

The impact of the global recession on the G7 and E7 economies has been quite varied. In a nutshell, while the recession and the ongoing economic malaise have knocked the wind out of the G7 economies, the impact on most of the E7 countries has been relatively muted. Five of the G7 economies – Britain, France, Italy, Japan, and the United States – all suffered back-to-back declines in GDP both in 2008 and 2009. Canada and Germany, however, posted declines in GDP on a calendar year basis only in 2009.

In contrast, four members of the E7 group – Brazil, Mexico,

Russia, and Turkey – experienced declines in economic activity only in 2009 with the fall in GDP ranging from a low of – 0.6% in Brazil to a high of – 7.8% in Russia. Moreover, the economies of China, India, and Indonesia rode out the financial storm and sailed through the global recession without posting a single negative year of growth.

Since climbing out of the Great Recession, the recovery has been weak across the board for all of the G7 economies and there are growing fears that another economic downturn may be unavoidable. For example, for the G7 group as a whole, growth in GDP averaged 2.7% in 2010 but weakened to 1.3% in 2011 and is expected to slip even further and average just 0.6% this year. In contrast, while a slowdown is also anticipated in all the major emerging economies because of the global inter-linkages, there is no talk of recession. Economic growth in the E7 averaged 7.5% in 2010, 6.0% in 2011 and is projected to slip to 5.2% this year.

It is these divergent trends in growth that have significantly altered the global economic landscape. To put things in perspective, over the four year period from the end of 2007 through to 2011, only four of the G7 economies have regained their pre-recession levels of output. Canada has been the best performer in this group but despite that it is still only 3.1% larger than it was in 2007. The size of Germany’s economy, the second best performer, is 1.8% larger while the United States and French economies have just managed to move ahead of where they were in 2007.

Three of the G7 economies – the United Kingdom, Japan, and Italy – have failed to recover the output lost from the 2008–09 recession and find themselves essentially stuck in what amounts to a long drawn-out economic slump. The UK economy is 2.6% smaller than it was in the pre-recession peak year of 2007, Japan’s is 4.2% smaller, and Italy’s is 4.7% smaller.

THE WORLD ECONOMY RECALIBRATES (Cumulative change in Real GDP between 2007 and 2011, in percent)			
G7 Countries		E7 Countries	
Canada	+3.1	China	+44.6
Germany	+1.8	India	+34.6
United States	+0.6	Indonesia	+25.2
France	+0.1	Brazil	+16.5
United Kingdom	–2.6	Turkey	+11.2
Japan	–4.2	Russia	+5.2
Italy	–4.7	Mexico	+3.9

Source: IMF

In contrast to the G7 countries, the production of goods and services is bigger today in all the E7 economies than it was in 2007. China’s economy is 44.6% larger than it was before the crisis and despite a slowing down of growth its GDP

29 Ranga Chand’s Notes on the Global Economy and World Financial Markets, January 2012. <http://rangachand.com/commentary/2012/01/e7-growth-performance-trumps-g7/>. Reproduced with permission. Ranga Chand is a prominent Canadian economist.

is likely to expand by another 8.2% this year. Similarly, India's economy is 34.6% larger, Indonesia's is 25.2% and Brazil's is 16.5% bigger. Even Mexico's economy, which is 3.9% larger and, therefore is the E7's worst performer, has outperformed every single member of the G7.

The major advanced economies now face years of struggle and none of them are likely to see a return to pre-crisis rates of growth for the next few years. Indeed, several of the G7 economies including Britain, France, Germany, and Italy could be heading back into recession as the recovery is increasingly showing signs of coming unstuck. Unemployment is rising again in Europe, retail sales are falling, and although inflation has started to edge down it still remains above central bank targets. Moreover, the need to reduce budget deficits and rein in unsustainable debt-to-GDP ratios – which are at alarmingly high levels in all the G7 economies – risks further entrenching the recessionary conditions in which these economies find themselves stuck.

With the outlook for growth diverging sharply, the G7 countries are split into two camps – the United States and Canada are expected to grow at around 2% in 2012 and Japan's economy is also likely to see its output rise by a similar amount as the country rebuilds from last year's devastating tsunami and earthquake. On the other hand, the outlook for European economies is darkening. With the debt crisis in the eurozone countries continuing to swirl and showing no sign of easing, the IMF in its latest forecast expects the region's GDP to contract by 0.5% this year. Italy, the region's third largest economy is projected to decline by 2.2%, by far the worst performer of any G7 economy.

It is now abundantly clear that, more than two years after the end of the Great Recession, a sustained recovery remains stubbornly elusive for the major advanced economies. Despite massive amounts of monetary and fiscal stimulus, the rate of growth in all of the major advanced economies has been sharply below their respective long-term averages. Moreover, constrained by large debts and deficits, not a single G7 country is expected to achieve growth rates above, or even at, its long-term average for several more years.

In contrast, since 2007, growth in the economies of the E7, despite the ongoing global turbulence, has not deviated much from their long-term averages. By 2020 this bloc, given the current trends, will surpass the G7 and account for a greater share of world output. This, in turn, will lead to a shift in the current geo-political power structure. Whether this will be muted or more pronounced remains to be seen.”

BRICS – THE EMERGING ECONOMIES

BRICS is an international political organisation of leading emerging economies, arising out of the inclusion of South Africa into the BRIC group in 2010. As of 2012, its five members are Brazil, Russia, India, China and South Africa. With the possible exception of Russia, the BRICS members are all developing or newly industrialised countries, but they are distinguished by their large economies and significant influence on regional and global affairs. As of 2012, the five BRICS countries represent roughly one-third of the world's total population, with a combined nominal GDP of US\$13.6 trillion, and an estimated US\$4 trillion in combined foreign reserves. The next BRICS summit will be in India in 2012.

“... [T]he rising powers of Brazil, Russia, India, China, and South Africa (the BRICS) hold an estimated \$4 trillion in foreign reserves and make up one-third of the world's 6 billion population. And they are posing new challenges to the world order shaped by the West.

From Europe, many see the BRICS as less interested in shared ideas of a multilateral world, and more inclined toward a nationalistic, multipolar world that emphasizes their own new strengths and interests. The result is fading authority and consensus on the world stage. The cold war “spheres of influence” between two powers are long gone. The new world order of American dominance has faded. But no clear leadership or rules have replaced this. New fights between trends of human rights and democracy – and sovereignty – have no rules as of yet.”³⁰

30 Amid BRICS' Rise and 'Arab Spring', a New Global Order Forms. Christian Science Monitor, 18 October 2011. www.csmonitor.com/World/Global-Issues/2011/1018/Amid-BRICS-rise-and-Arab-Spring-a-new-global-order-forms.

CURRENT AND PROJECTED RELATIVE SIZE OF ECONOMIES IN 2009 AND 2050 TO THE US (US = 100)³¹

Country (indices with US = 100)	Relative size of GDP at MERs to the US		Relative size of GDP at PPPs to the US	
	2009	2050	2009	2050
US	100	100	100	100
Japan	36	20	29	20
China	34	135	62	157
Germany	23	15	21	15
France	19	14	15	14
UK	15	15	16	15
Italy	15	10	13	10
Brazil	11	24	14	26
Spain	10	8	10	8
Canada	9	9	9	9
India	9	83	26	114
Russia	9	16	19	20
Australia	6	7	6	7
Mexico	6	15	11	18
South Korea	6	8	9	9
Turkey	4	12	7	14
Indonesia	4	14	7	16
Saudi Arabia	3	7	4	8
Argentina	2	6	4	7
South Africa	2	6	4	6
Nigeria	1	10	2	12
Vietnam	1	8	2	10

Source: World Bank estimates for 2009, PwC model estimates for 2050

31 *The World in 2050*. PriceWaterhouseCoopers Report from Project Blue, January 2011. www.pwc.com/en_GX/gx/world-2050/pdf/world-in-2050-jan-2011.pdf.

APPENDIX 4: REVIEW OF PAST REPORTS

In August 2006, the Food and Beverage Taskforce issued the report³², *Smart Food, Cool Beverage: New Zealand's Future in the Food and Beverage Sector*.

The foreword to the report states:

“The Food and Beverage Taskforce was asked to assemble a development agenda for the sector and to secure stakeholder ownership of that agenda and commitment to its implementation. We were asked to help shape strategic thinking in the sector, by providing vision, drive and detail, based on a sound analysis of current strengths, weaknesses, opportunities and threats.

“Ultimately this report is a call for action by the sector itself, its leaders and the many individuals who work within it. This is something the Government cannot conscript. There is no viable future for the sector if it waits for the Government to take it by the hand.

“Our terms of reference stress that the ideal outcome is that the resources of industry, Government, science and education are focused in partnership to deliver faster, smarter, sustainable growth in the sector.”

This call for action has had only marginal effect on the agri-business industry and has been repeated a number of times in the last 5 years.

A major conclusion of a report from the UK Government Office for Science³³ on the future of food and farming is:

“the critical importance of interconnected policy-making ... policy in all areas of the food system should consider the implications of volatility, sustainability, climate change and hunger.

... policy in other sectors outside the food system also needs to be developed in much closer conjunction with that for food. These areas include energy, water supply, land use, the sea, ecosystem services and biodiversity”.

Although this report's focus is the global scene, the conclusions apply in microcosm to New Zealand, and New Zealand Government policy making is likely to be more interconnected and appropriate if policies are based on the optimal use of information and science-based evidence³⁴.

Procter³⁵ argues that New Zealand's policy settings must be close to world best practice if New Zealand is going to close the gap with the high income OECD countries.

“If the New Zealand economy is to grow faster, it will have to restructure more quickly towards higher value activities.

This restructuring will likely build on New Zealand's current comparative advantage in the food and fibre and related industries, both by increasing productivity within those sectors and by building into more sophisticated food and similar products. The economy will also restructure towards high value knowledge intensive (high income content) goods and services across all sectors where New Zealand has or can generate the requisite capabilities, including in particular goods and services associated with the primary sector.”

In April 2010, the Riddet Institute held an Agri-Food Summit to bring together key influencers to discuss *Positioning New Zealand's Research and Education Resources* in the agri-food sector.³⁶

Dijkhuizen outlined the successful development of the Wageningen University & Research centre, arising from the combination of two academic institutions and nine research institutes, creating a single integrated model, with a common governance, for research and teaching delivery in agri-food. Gluckman emphasised the importance of food for health, supported by scientific research leading to robust claims as a major area in which large premiums can be maintained and sustained. Watson stressed the value of food to the health of the nation (*“The obesity epidemic and the poorer health of young people have been triggers for world food scientists to research foods that can promote health and wellness”*) and to the growth of the export economy.

32 *Smart Food, Cool Beverage: New Zealand's Future in the Food and Beverage Sector*. The Food and Beverage Taskforce, August 2006. www.nzte.govt.nz/access-international-networks/Explore-opportunities-in-growth-industries/growth-industries/Documents/fbtaskforce-finalreport.pdf.

33 *The Future of Food and Farming: Challenges and Choices for Global Sustainability*. Final Project Report. Foresight. UK Government Office for Science, London, 2011, p. 11. www.bis.gov.uk/assets/foresight/docs/food-and-farming/11-547-future-of-food-and-farming-summary.

34 *Towards Use of Better Evidence in Policy Formation: A Discussion Paper*, April 2011. www.pmcsa.org.nz/wp-content/uploads/Towards-better-use-of-evidence-in-policy-formation.pdf.

35 Procter R. *Enhancing Productivity: Towards an Updated Action Agenda*. Ministry of Economic Development Occasional Paper 11/01, March 2011. www.med.govt.nz/about-us/publications/publications-by-topic/occasional-papers/2011-occasional-papers/11-01-pdf/view

36 *Positioning New Zealand's Research and Education Resources*, New Zealand Science Review, 67 (3), 2010.

Gluckman and Cleland bemoaned the low spend on R&D in New Zealand (1.2% of GDP compared with 2 to 3 times that in peer countries), particularly the low spend by the private sector.

Cleland also stressed the importance of intangible capital (human capital and the quality of institutions in society) as the key ingredient in the wealth of nations – New Zealand has a low intangible capital relative to peer countries. He also pointed out that New Zealand has relatively low capital intensity, poor fast follower adoption of new technology and poor take-up and use of research by the private sector. He made a plea for a balanced economy – strongly growing performance from the biological sector as well as the physical and virtual technology sector.

Reports^{37,38,39} published recently have discussed the Māori economy and the central role played by agri-food business in that economy (see appendix 8). The BERL report³⁷ to the Māori Economic Taskforce (which was established in March 2009 as a result of the Māori Economic Summit) is cited as a landmark in recognising the “Māori economy” as being economically important to New Zealand and a potential “game changer” in the Government’s Economic Growth Agenda. The issues facing the Māori economy mirror those of the New Zealand economy as a whole, with some distinctive differences relating to cultural aspects of the Māori worldview. FoMA⁴⁰ sees Māori as critical to the future prosperity of New Zealand. Its emerging strategy is entitled *Kia Mahi Tahi Tatou – “all work together as one”*.

KPMG⁴¹ had this to say:

“Many sector strategies have been prepared; often dealing with very similar issues, however there is no overriding pan-industry strategy. We need an overriding vision of what New Zealand wants its agricultural sector to look like in 20 years and 50 years time, so that long-term decisions can be made within a framework of what the industry wants to achieve. There are significant issues that need to be addressed in the next decade which will shape the future of agribusiness (GMO, intensification, organics, global sourcing etc.). A widely accepted vision for the industry will help guide the debate and assist with quality decision making around key issues.”

In their more recent report⁴², KPMG have suggested exploring the creation of an umbrella body that could provide a unified voice to Government and the wider

population, and stressed the importance of the influence of talent, motivation, education and commitment of the people working in the primary sector and the benefits from creating a pan-industry strategy. They also stated “innovation cannot be left to the Government; companies need to take the lead”.

Coriolis Research⁴³ has shown that New Zealand’s food and beverage exports are growing strongly and that the country’s performance relative to some selected peers is improving. It also notes that, although New Zealand is a major global food and beverage exporter, the country has significant untapped capacity to export more.

“New Zealand is a country the size of Italy with the population of Singapore. However Italy feeds a domestic population of 60m people and exports twice as much F&B as New Zealand. ... New Zealand is a young country still discovering its comparative advantages and new industries continue to emerge. In the past twenty years New Zealand wine, honey, aquaculture and avocados have all emerged from almost nothing into world leading sectors.”

Coriolis Research⁴⁴ also reports the significant growth rate of processed foods (“foods made from a combination of ingredients rather than one single or predominant ingredient e.g infant formula vs milk powder”) – exports in 2010 totalled \$1.7 bn with a CAGR of ~15% for the last decade.

An independent report commissioned by the Ministry of Science and Innovation (MSI) and published in June 2011⁴⁵ makes many recommendations that are relevant to the agri-food sector and stresses the need for urgent action if New Zealand’s wealth is to grow at the desired rate. This report also stresses the need for growth in all sectors of the economy.

The Ministry of Economic Development reported a research study on management practices and productivity in the New Zealand Manufacturing Sector⁴⁶. Food and beverage companies were included in the study. The findings suggest that while some of New Zealand’s firms are as good as any in the world, there is a substantial ‘tail’ of firms that are mediocre, especially in their approach to people management. The research findings also suggest that there is a link between the quality of management and enterprise productivity. This study suggests that New Zealand manufacturing firms need to improve the management performance to build longer-term

37 Nana G, Stokes F & Molano W. *The Māori Economy, Science and Innovation*. BERL Report to Māori Economic Taskforce, May 2011. www.tpk.govt.nz/_documents/taskforce/met-rep-ecosciinnovate-2011.pdf.

38 *Owners’ Aspirations Regarding the Utilisation of Māori Land*. Te Puni Kōkiri, April 2011. www.tpk.govt.nz/en/in-print/our-publications/publications/owners-aspirations-regarding-the-use-of-maori-land/page/21/.

39 *Māori Agribusiness in New Zealand: A Study of the Māori Freehold Land Resource*. MAF, March 2011. www.maf.govt.nz/news-resources/publications?title=Maori.

40 *Federation of Māori Authorities (FoMA)*, personal communication, March 2011.

41 KPMG Agribusiness Agenda 2011. *Realising Global Potential*. www.kpmg.com/NZ/en/IssuesAndInsights/ArticlesPublications/agribusiness-agenda/Documents/Agribusiness-Agenda-2011.pdf.

42 *Agribusiness Agenda 2012* KPMG

43 *An Investor’s Guide to the New Zealand Food & Beverage Industry*. Coriolis Research, October 2011. www.med.govt.nz/sectors-industries/food-beverage/pdf-docs-library/information-project/investors-guide-2011.pdf.

44 *Sector Stream – Processed Foods*. Coriolis Research for Food & Beverage Information Project October 2011.

45 *Powering Innovation. Improving Access to and Uptake of R&D in the High Value Manufacturing and Services Sector*. www.msi.govt.nz/assets/1.pdf.

46 *Management Matters in New Zealand: How Does Manufacturing Measure Up?* Roy Green and Renu Agarwal. Ministry of Economic Development Occasional Paper 11/03. March 2011

competitive advantage. A cost effective way of improving the performance of New Zealand firms is to promote a transformation in the calibre of the management and leadership of its organisations. The report concludes this is a key to a more innovative, dynamic and sustainable economy into the future.

During 2011, The Primary Sector Value Chain Integration Project held a series of workshops around New Zealand – the foreword to their report states:

“We can create changes within our Food, Fibre and Agribusiness Industry that will help us seize a positive future. These changes will break our heritage of commodity dependence and firmly position our Primary Sector Industries as the innovative economic powerhouses that we know that they should be.”⁴⁷

This Value Chain Integration project identified 18 key recommendations to transform New Zealand’s primary sector industries and covered eight themes:

Innovation for value add	Production systems and resources
Human capital	Public/Private governance
Value chain capture	Risk mitigation
Investment	The New Zealand story (branding)

Our report follows on from and builds on this Value Chain Integration report, focusing particularly on the R&D and capability requirements of a national food strategy.

The following is a list of documents and presentations that have informed our thinking. The list is not exhaustive; neither have we taken all parts of all documents into account. It is intended to demonstrate the breadth of material consulted and to provide sources of further information.

Agri-Food Summit Papers:

New Zealand Science Review, 67 (3), 2010 – whole issue.

Food and Beverage Taskforce

Smart Food, Cool Beverage: New Zealand's Future in the Food and Beverage Sector. Innovation Working Group, The Food and Beverage Taskforce, August 2006.

Mapping the Structure of the New Zealand Food and Beverage Industry. Coriolis Research, November 2005. This report has lots of analyses, facts and figures, but is somewhat dated. It was produced in 2005, but most figures relate to 2002.

MoRST and FRST

(These documents were available on the MoRST and FRST websites, which have since disappeared.)

MoRST Draft Food Research Roadmap.

Submissions on MoRST Food Research Roadmap.

NZIER Report to FRST, 2004.

Nimmo-Bell Report (on the New Zealand food processing sector), 2003.

Other Government Reports and Presentations

New Zealand Energy Strategy 2011–2021. MED, 2011.

NZTE: Briefing to Incoming Ministers, 2011.

Economic Development Portfolio Briefing for the Incoming Minister. MED, 2011.

Research and Development in New Zealand: 2010. Statistics New Zealand, 2011.

NZTE Value Chain Integration Project presentation. Dunedin Workshop, 08 June 2011.

Ministry of Economic Development *Food and Beverage Information Project* web pages: www.med.govt.nz/sectors-industries/food-beverage/information-project.

R&D in Agriculture: Getting More from the Biological Industries. MSI presentation to the Plant Market Access Council, 18 October 2011.

NZIER Reports

(These are available on the NZIER web site: www.nzier.org.nz/publications.)

WP2008-03: *Catching up with Australia* (September 2008).

Dairy's Role in Sustaining New Zealand (Report to Fonterra and DairyNZ, December 2010).

Farming in New Zealand: the State of Play and Key Issues for the Backbone of the New Zealand Economy (published in *Farm Policy Journal*, 1 (1), 2004).

WP2011-03: *Industry Productivity and the Australia–New Zealand Income Gap* (September 2011).

WP2004-01: *Monitoring New Zealand's Star Performers* (Report to FRST, March 2004).

WP2009-07: *Sustainable Development: Have We Got Our Priorities Right?* (November 2009).

NZIER Insight 19: *Realistic Valuations of Our Clean Green Assets* (October 2010).

NZIER Insight 10: *Animal Welfare* (December 2009).

Other New Zealand Papers

Standing on the Shoulders of Science. The New Zealand Institute (December 2009).

The Level of Added Value in New Zealand Food Exports. Winger R J, Power E G, Mawson A J, Rae A N & Mesiter A D. Report for NZTE, July 2003.

Export Development and Promotion. Lessons from Four Benchmark Countries. Boston Consulting Group, May 2004.

Food Miles – Comparative Energy/Emissions Performance of New Zealand's Agriculture Industry. Lincoln University, July 2006.

An Overview: Horticulture Industry. Strategy: 'Growing a New Future'. Horticulture New Zealand, July 2009.

Red Meat Sector Strategy Report. Deloitte Report for Beef + Lamb New Zealand Limited and Meat Industry Association of New Zealand, March 2011.

Primary Sector Water Partnership Leadership Document. Draft, May 2008.

Managing Our Own Ship; Making Collective Action Work for Industry. Seafood Industry Council, October 2009.

The New Zealand Aquaculture Strategy. Commissioned by the New Zealand Aquaculture Council, July 2006.

Competition for Land Use in New Zealand. Royal Society of New Zealand, 2011.

Virtual Water. Emerging Issues. Royal Society of New Zealand, 2009.

Into the Future. What Could New Zealand Look Like in 2050, and Will Your Business Be There? NZBCSD Annual Review. New Zealand Business Council for Sustainable Development, December 2011.

Green Growth – Issues for New Zealand. Green Growth Advisory Group, July 2011.

Greening New Zealand's Growth. Green Growth Advisory Group, December 2011.

A Fresh Start for Freshwater. Land and Water Forum, 2010.

Fruit and Vegetable Sector Projections 2006 to 2012 – Ancillary Research. BERL Report to Horticulture New Zealand.

Annual Reports from DairyNZ, Fonterra, Beef + Lamb New Zealand, Horticulture New Zealand and ZESPRI.

Enhancing Productivity: Towards an Updated Action Agenda. Procter R. MED Occasional Paper 11/01, March 2011.

A series of articles by David Irving on small and medium sized enterprises - <http://www.theicehouse.co.nz/tabid/140/Default.aspx>

Enhancing Value for New Zealand Farmers by Improving the Value Chain. Saunders, C., McDonald, H. & Driver, T. (2011) Agribusiness and Economics Research Unit, Lincoln University.

The Māori Economy, Science and Innovation. Nana G, Stokes F & Molano W. BERL Report to the Māori Economic Taskforce, May 2011.

Iwi Infrastructure and Investment. Māori Economic Development Taskforce, May 2010.

KPMG Agribusiness Agenda 2011. Realising Global Potential.

KPMG Agribusiness Agenda 2012. People Unlocking the Future.

Statements of Corporate Intent. Crown Research Institutes.

Genetically Modified Forages. Emerging Issues. Royal Society of New Zealand, March 2010.

New Zealand's Clean Green Image: Will GM Plants Damage It? John G Knight, Marketing Department, University of Otago, New Zealand. March 2011.

Water Quality in New Zealand: Understanding the Science. Parliamentary Commissioner for the Environment, March 2012.

UN and FAO Material

World Agriculture: Towards 2030/2050. FAO Interim Report, Global Perspective Studies Unit, FAO, Rome, June 2006.

OECD–FAO Agricultural Outlook 2008–2017. FAO, Rome, 2008.

FAO – The State of Food and Agriculture 2009 –Livestock in the Balance. FAO, Rome, 2009.

World Population Prospects, The 2010 Revision. Population Division, UN Department of Economic and Social Affairs, 2011.

Virtual Water in Food Production and Global Trade. Review of Methodological Issues and Preliminary Results. FAO, Rome.

Other Global Agencies

The Global Competitiveness Report 2010–2011. World Economic Forum, 2010.

Growing a Better Future: Food Justice in a Resource-constrained World. Oxfam, 2011.

The Future of Health & Wellness in Food Retailing Institute for the Future, Palo Alto, CA, 2008.

Global Food Outlook. Institute for the Future, Palo Alto, CA, 2011.

Achieving Food Security in the Face of Climate Change: Summary for Policy Makers from the Commission on Sustainable Agriculture and Climate Change. CGIAR Research Program on Climate Change, Agriculture and Food Security, November 2011.

Climate Change – Impact on Agriculture and Costs of Adaptation. International Food Policy Research Institute, November 2009.

Food Security, Farming and Climate Change to 2050. Scenarios, Results, Policy Options. International Food Policy Research Institute. Advance Copy, 2011.

UK Food Strategy Material

UK Cross-Government Food Research and Innovation Strategy. UK Government Office for Science, London, January 2010.

Foresight. The Future of Food and Farming. UK Government Office for Science, London, 2011.

Reaping the Benefits: Science and the Sustainable Intensification of Global Agriculture. Royal Society, October 2009.

The Race to the Top. A Review of Government's Science and Innovation Policies. The Sainsbury Review. UK Government, October 2007.

The Future of the Global Food System:

Philosophical Transactions of the Royal Society B, 365, 2010:

- Introduction. Godfray H C J, Crute I R, Haddad L, Lawrence D, Muir J F, Nisbett N, Pretty J, Robinson S, Toulmin C & Whiteley R, pp. 2769–2777.
- *Dimensions of global population projections: what do we know about future population trends and structures?* Lutz W & Samir K C, pp. 2779–2791.
- *Urbanization and its implications for food and farming* Satterthwaite D, McGranahan G & Tacoli C, pp. 2809–2820.
- *Managing uncertainty: a review of food system scenario analysis and modelling* Reilly M & Willenbockel D, pp. 3049–3063.
- *Food waste within food supply chains: quantification and potential for change to 2050.* Parfitt J, Barthel M & Macnaughton S, pp. 3065–3081.

Other Papers and Presentations

Making Safe, Affordable and Abundant Food a Reality: The Three Rights: Food, Choice, Sustainability. Elanco Animal Health, March 2011.

The World in 2050. The Accelerating Shift of Global Economic Power: Challenges and Opportunities. PriceWaterhouseCoopers, January 2011.

Effects of Climate and R&D on Australian Agricultural Production. ABARE Report. Australian Bureau of Agricultural and Resource Economics.

The Global Trends and their Impact on the Food and

Drink Industry: 2020 and Beyond. A series of three podcasts by Professor David Hughes, available at: www.profdavidhughes.com/category/podcasts/globalfoodpodcast/.

The Evolution of Ireland's Kerry Group/PLC – Implications for the U.S. and Global Dairy-food Industries. Babcock Institute Discussion Paper No. 2002-2. University of Wisconsin, 2002.

A Turning Point in Agricultural Productivity: Consideration of the Causes. ABARES Research Report 11.4. Australian Bureau of Agricultural and Resource Economics and Sciences, 2011.

APPENDIX 6: FORESIGHT: AGRI-FOOD IN NEW ZEALAND IN 2025

Early in the process of writing this report, there was a discussion to develop a foresight of the agri-food sector in New Zealand.⁴⁸ The following is a summary of that discussion.

NEW MARKET OPPORTUNITIES:

The world population is 8 billion. Global demand for food has substantially increased since 2011, but demand for protein and for animal products has increased still further. New Zealand has played an important role in providing animal products, particularly dairy products, to developed and developing economies. A very much greater proportion of New Zealand's foods and beverages is being marketed in Asia than in 2011.

New Zealand opted not to be a commodity supplier solely to one country (e.g. China) or to focus entirely on feeding Australia.

New Zealand targets the wealthy middle-class, particularly in Asia and, increasingly, in India. New Zealand food businesses are highly resilient and adaptive, through responding successfully to the continual changes in market conditions brought about by global economic instability and climate change.

New Zealand food processors and exporters are using IP-protected food system platforms for the global delivery of foods and ingredients that align with and are complementary to the functionality of local cuisine and ingredients, providing meal solutions with, for example, curry, spices, rice etc.

New Zealand is perceived as a secure source of safe and nutritious foods and ingredients, underpinned by a New Zealand-developed effective non-invasive scanning tool to ensure safe food.

EXPERTISE IN MARKETING:

Appropriate capital structures and business development strategies, and the necessary skills and capacities in business management and corporate governance are in place.

Brands under a "NZ Inc." umbrella are differentiating foods and ingredients and adding value.

New Zealand Inc. has adopted "Agile Marketing", which is an approach to international food business that is highly adaptive and very resilient. The systems make effective and intensive use of personal communication technologies (social media). These systems include strength in

traceability, provenance, food safety and providing "NZ Inc. Brand Stories" that are aligned with changing and developing consumer needs, and establish consumer relationships based on trust.

There has also been the emergence of tailored niche brands that support more intimate consumer relationships.

New Zealand is a major global marketer of farm machinery, specialised food processing equipment and robotics technology.

VALUE CHAINS:

In 2012, New Zealand established a centre of excellence in value chain management, setting standards for integrity and best practice. This has led to considerable uptake of New Zealand businesses working closely with consumers at the point of purchase. Novel and enhanced communication technologies give a hitherto unknown intimacy between consumer and producer, bypassing many of the traditional lines of distribution. Supply is now directly to consumers from processing plants and their associated warehouses, with consumers purchasing product directly from the producer. Attention to consumer needs and understanding of uses of the products mean that New Zealand is able to add a "consumer-friendly" cachet to the "clean green" tag to enhance the perceived value of products.

Food production, processing and logistics are all attuned well to shifts in energy sources and higher energy costs.

TYPES OF FOOD PRODUCED AND CONSUMED:

Globally, there is a continuing homogenisation of cultures, with the "McDonald's" culture permeating everywhere, but at the same time a strong counter trend to modern equivalents of traditional foods, especially for "special occasion" use (weekends, family occasions, celebrations etc.). New Zealand's attention especially to the latter sector is an important factor in gaining the high ground in emerging markets.

EXPERTISE IN NUTRITIONAL FOODS:

The sector built on its historical expertise through R&D, international R&D partnerships, acquisitions of innovative offshore companies and understanding of consumers' nutritional needs and practices in a range of markets. This expertise is now a strong competitive

⁴⁸ Dr Wayne Cartwright facilitated the foresight exercise. Participants were John Brakenridge, New Zealand Merino; Fraser Broom, Foundation of Research, Science and Technology; Kieran Elborough, Plant & Food Research Ltd; David Page, Fonterra Ltd; Carol Ward, ZESPRI Ltd; Andy West, Tidal Associates; and the members of the Thought Leadership Team. The discussion took place over a day and a half at Sileni Estates Winery, 02-03 May 2011.

advantage. New Zealand is a world leader in the development and marketing of the “next-generation nutraceuticals” that have emerged in response to consumer concerns about nutritional deficiencies.

Globally, there is only low acceptance of substituting protein from lower cost sources, derived directly from crops and microorganisms, rather than animal protein – New Zealand has maintained a watching brief on these technologies.

PERSONALISED NUTRITION:

Personalised food products and diets, based on DNA profiling and lifestyle, and targeted to health and well-being, are the norm. New Zealand’s leadership in developing products, delivery systems, clinical proof of efficacy and regulations makes it a world leader in healthy foods.

WORLD LEADERSHIP IN “LOW-NEWP” PASTORAL FARMING SYSTEMS:

New Zealand redeveloped its expertise in soils systems and, in the expectation of global limits on rates of release of nitrogen and phosphate into waterways and groundwater and the need for more efficient use of water, established a Centre of Research Excellence in Sustainability in 2013. The R&D programmes led by this centre transformed New Zealand’s pastoral farming. The innovations from this programme include:

- Low/no requirements for nitrogenous fertilisers (Low-N);
- Low reliance on hydrocarbon fuels and other energy sources (Low-E)
 - renewable sources of electricity, along with electrification of most vehicles, and
 - new technologies for distributed electricity generation;
- Low requirements for water and effluent discharged to water (Low-W);
- Low reliance on phosphate fertilisers (Low-P);
- Genetically modified (GM) pastures and fodder for efficient production (efficient use of water, nitrogen, phosphate and pest resistance and better nutrition for animals);
- Closed-cycle systems for the treatment of most dairy animal wastes – minimising discharge, utilising nutrients and generating energy.

Low-NEWP has led to:

- Competitive advantages in international food markets;
- Licensing of the IP of Low-NEWP and its technologies overseas;
- Effectively countering the arguments emerging in

2011 that pastoral farming is ecologically destructive and unsustainable.

New Zealand farmers have resisted the temptation to convert land suitable for food production to the production of crops for biofuels.

OUTWARD DIRECT INVESTMENT:

New Zealand has leveraged its own increased production (achieved by GMOs, sustainable intensification using home-grown technologies and novel efficient processing) and globalised New Zealand-based businesses through appropriate arrangements in key economies, notably BRICS (Brazil, Russia, India, China and South Africa), to build on local production. This has included setting up companies offshore to process local foods and ingredients imported from New Zealand.

This has mitigated the external political pressure to supply, globally, more basic nutritional products from the limited land and resources in New Zealand. Nevertheless, New Zealand remains under pressure to accept a much larger immigrant population.

IMAGE OF NEW ZEALAND:

Virtual tourism and surrogate tourism have become the norm, using new immersion virtual reality entertainment. New Zealand’s environment and its tourist value are able to capitalise on this to place in the consumer’s consciousness that New Zealand is clean and green, with magnificent landscapes, flora and fauna, and that New Zealand society is stable, professional and reliable, and this spills over into perceptions of its products.

CLIMATE CHANGE:

New Zealand has managed climate change to its advantage, developing robust forage species, managing water and using intensive precision farming in ways that ameliorate the adverse effects of climate change, which enhances New Zealand’s natural competitive advantage.

The resilient and adaptive approach of New Zealand food businesses is well suited to these conditions.

However, changes in the New Zealand climate have required:

- the protection of high value flood plains,
- the retirement of certain classes of hill country and coastal margins,
- water storage and reticulation in some eastern districts, and
- the protection of coastal fish farms from toxic algae (because of higher ocean temperatures).

The effects of climate change have made aspects of food production more risky and have increased some categories of costs; however, New Zealand is affected less than its major competitor countries in international food markets.

The New Zealand Agricultural Greenhouse Gas Centre has developed technology that has reduced greenhouse gas emissions from pastoral farming to 25% of the levels prevailing in 2011.

DISTANCE FROM MARKETS:

This continues to be an issue. Novel processes and packaging mean that “fresh” products, such as fruit juices, whole milk, fresh dairy products and fresh meat cuts, are produced with a shelf life in excess of 30 days, and thus are being shipped by sea freight to most markets, particularly those in which increased urbanisation has driven demand for fresh-tasting foods and increasing dependence on prepared foods and food service. Novel technologies are being used to reduce the weight and volume of food products and to adopt preservation technologies that avoid refrigeration to address the problem of increasing costs of transport.

CONTINUING THREATS:

Global warming and severe weather events have intensified biosecurity risks. Although these are largely being mitigated by novel technologies, the risks are still a major concern.

The increasing costs of water, energy and food continue to result in significant periods of international economic and social turbulence that have interrupted New Zealand’s markets.

CONCLUSIONS:

This foresight indicates a clear imperative for the food sector of New Zealand. To contribute to the well-being of New Zealand as anticipated in the Economic Growth Agenda, the sector must implement strategies that:

- **anticipate change and develop responses to it in advance;**
- **have built-in, low cost adaptability through the value chains of the sector;**
- **are systemically resilient to shocks;**
- **adapt easily to new laws;**
- **adopt advanced technological approaches to production, sustainability and processing;**
- **lead to greater collaboration and co-operation.**

These strategies require significant new investment in science, new technologies, innovation and technology transfer.

It was noted that the development of an agri-food strategy foresight was a very challenging task because it was being undertaken at a time of emergent huge change – globally and locally. It is likely that the scale and the complexity of aspects of this change will eventually be outside the range of human experience and historical data. A consequence is that much of the science, technology and experience that the food sector now relies upon will become insufficient and subject to ever-stronger requirements for updating and replacement.

In principle, it is no longer sensible to consider the future as a projection based on the logic of the current “business as usual” operations of the food sector. Although aspects of the foresight are no doubt reasons for concern, it is critical that the leadership of the food sector (and, indeed, the whole of New Zealand) feels positive and stimulated by the prospect of the challenges that are emerging

APPENDIX 7: 2011 SWOT ANALYSIS

STRENGTHS

Geography:

New Zealand's production is based on a temperate climate with long growing seasons and good rainfall, as well as large areas that are suitable for cropping, pastoral farming and dairying, large areas that are suitable for hill country meat production and a long coastline (comparable with that of continental USA) suitable for aquaculture and a large marine economic zone.⁴⁹ New Zealand has a broad range of climatic zones that provide buffering against climate change – on average, projections show no strong trend in pastoral farming outputs during the coming century in production when accumulated over the whole country (although there may be regional differences).⁵⁰

Water:

New Zealand is well endowed with water (90% of water in rivers reaches the sea) and this provides a global comparative advantage. Water underpins all aspects of development. A coordinated approach to managing and allocating water is critical. Water is severely limiting food production in the temperate regions of the world including Australia.⁵¹ Water harvesting and new ways of harvesting water and using it efficiently are important and this is being addressed in New Zealand. Water quality in

New Zealand, although generally good by international standards, is declining according to data from the National Rivers Water Quality Network.⁵²

A recent OECD report rates New Zealand's water quality as relatively good but warns that, whereas standards in other countries are improving, the opposite is happening here.⁵³

Efficiency:

The New Zealand farming sector is an effective producer, with relatively low production costs (in both dollars and environmental resources) and efficient processing. We enjoy a relative disease free status in our primary sector and have an effective biosecurity regimen.

Reputation:

New Zealand is a trusted name in food production in traditional markets (although virtually unknown in many emerging markets), known as a producer of high quality, safe food products. The integrity of our supply chains is recognised worldwide.

Global Food Producer:

New Zealand produces enough food (calories) to feed around 20 million people, enough protein (mostly high value protein) to supply the needs of 45 million and enough dairy products to supply the dairy consumption

A recent OECD report has looked at nutrient balances by considering all the nitrogen and phosphorus going into systems and calculating how much was used to grow crops and pasture.

In most situations, there was a surplus, which placed stress on the water, soil and air.

New Zealand's nutrient balance was below that of many countries in the OECD.

"The difference is you're increasing while a lot of countries are decreasing. The main reason is because the agricultural sector is expanding. That puts pressure on the water system."

In 2000, the average for New Zealand was around 35 kg nitrogen/ha; by 2008, it was about 45 kg/ha. The 2000 average for the 34 OECD countries was 80 kg/ha, but dropped to 65 kg/ha in 2008.

Source: The Water Challenge: OECD's Response. http://www.oecd.org/document/47/0,3746,en_2649_37465_36146415_1_1_1_37465,00.html.

49 New Zealand's exclusive economic zone is the fourth largest in the world, covering 2.2 million square kilometres.

50 *Costs and Benefits of Climate Change and Adaptation to Climate Change in New Zealand Agriculture: What Do We Know So Far?* Report prepared by the EcoClimate Consortium for MAF, March 2008. www.maf.govt.nz/environment-natural-resources/climate-change/research-and-funded-projects/research-and-funded-projects-table.aspx.

51 Nestlé's chairman said "... under present conditions and with the way water is being managed, we will run out of water long before we run out of fuel". The Environment. A Water Warning. The Economist, 19 November 2008.

52 Two decades of monitoring of river water quality by NIWA shows:

- "overall New Zealand's river water quality is in good condition by international standards, especially rivers in native forest and high country areas
- however rivers running through pastoral areas are degraded by nutrient enrichment, fine sediment reducing visual clarity, and contamination by faecal microbes."

Twenty Years of Monitoring Provides Insight into our River Water Quality. NIWA, February 2009.

<http://www.niwa.co.nz/news/twenty-years-monitoring-provides-insight-our-river-water-quality>.

53 *NZ Facing 'Time Bomb' on Water Quality*. www.stuff.co.nz/environment/5676626/NZ-facing-time-bomb-on-water-quality.

of 165 million (appendix 2). New Zealand can be a high value niche producer, targeting small affluent populations, and/or a supplier of high value (preferably branded) nutritional ingredients to improve the nutritional value of food in developing markets.

Capability:

We are champions at producing quality, safe food (but most consumers in emerging markets don't know that!).

Intellectual capital:

New Zealand has considerable intellectual capital in both production and processing of food, based on nearly 100 years of R&D that gives us

- knowledge-based efficient production systems,
- strengths in R&D and innovation (both historical and embodied in current practices and current products, with an able cadre of scientists and engineers),
- opportunities to leverage expertise to generate IP to meet new needs driven by consumer demand in emerging markets, and
- opportunities to make a contribution to international food security through the export of production IP to other food-producing economies and to the New Zealand economy through royalties and other such payments.

We are at the beginning of the supply chain and thus have the possibility for R&D to have great impact if we understand what the consumer wants.

Government support:

Recognition by Government of the importance of the agri-food export industry will continue to be an important factor in the success of the sector.

WEAKNESSES

The New Zealand agri-food sector faces a number of weaknesses.

Distance from markets:

The "tyranny of distance" makes it harder and more expensive to get good quality whole foods fresh to market, which is exacerbated by the increasing trends to slower steaming speeds and use of transshipment as shipping lines seek to reduce emissions and fuel costs – transit times to Europe have increased by up to 7 days, jeopardising, for example, the chilled meat trade. New Zealand depends on external providers to get goods to markets. Sea transport accounts for 84% by value of New Zealand's merchandise trade and is largely seasonal and volatile on a short term basis. Much of our agri-food production is regional and seasonal and leads to peaks and troughs in demand for shipping services – smoothing these out will

lead to efficiency in the use of shipping capacity.⁵⁴

Distance also leads to perceptions of cost, both in dollars and environmental impact, in destination markets, whether this is true or not. Distance can be a psychological barrier for New Zealand producers and manufacturers, leading to a lack of presence in markets and a lack of understanding of customer needs in-market, weaknesses that are further elaborated below. Although the geography of distance cannot be changed, the psychology of distance must be changed. A small domestic market and a large distance from big markets act as hurdles to businesses trying to grow from small to medium size, which are not faced by businesses in larger countries or countries with readily accessible domestic and export markets.

As the markets of growing importance to New Zealand, Asia and South America, are about equidistant from New Zealand and Europe, the tyranny of distance is reduced as a competitive disadvantage.

Lack of understanding of and connection to consumers and their changing needs in markets, coupled with a lack of consumer intimacy:

New Zealand is still largely focused on supplying traditional products to traditional markets using traditional supply chains (because these are our heritage and we understand them). These markets continue to be important, but the game changers will be new and emerging markets and market segments in Asia, Eastern Europe and South America (the BRICS countries and their ilk). The new customers in emerging markets eat different kinds of food, requiring new kinds of food ingredients and whole foods, and they shop in different ways, making much more use of the internet and social media.

Fragmentation:

With a few exceptions, notably Fonterra and ZESPRI, our agri-food industries are fragmented within sectors, between sectors and often along the value chain even before food leaves New Zealand. Similarly, the Government agencies dealing with agri-food are fragmented, with at least six ministries (Business, Innovation and Employment; Education; Primary Industries; Foreign Affairs & Trade; Environment and Te Puni Kōkiri) having responsibility for various aspects of the sector. Agri-food research capability is dispersed widely across a number of universities, CRIs, private research organisations and industry, with a limited number of integration arrangements. There is a lack of clear, strong overarching governance through much of the industry.

Relatively low levels of investment in R&D:

New Zealand has an agri-food research intensity (spend on R&D as a proportion of turnover) of only 0.9%, whereas countries such as Ireland, Japan, Finland, Denmark and Switzerland spend 2% and more. In

54 *Freight Partnership to Drive New Zealand Competitiveness*. July 2011. www.fonterra.com/wps/wcm/connect/fonterra.com/fonterra.com/our+business/news/media+releases/freight+partnership+to+drive+new+zealand+competitiveness

particular the spend by the agri-food industry is very low particularly when it is noted that Fonterra is more than \$100m of the industry's \$200m spend (see Appendix 11 for details).⁵⁵

Failure to embrace new technologies:

New Zealand is reluctant to become involved in new technologies such as GM food crops and irradiation of food. Although this could be seen to be politically correct in the 20th century, it will become increasingly seen as quaint and old-fashioned in the 21st century. Non-GM crops are rapidly becoming the minority proportion of the main species (such as soya bean, wheat and corn), and they are the norm in emerging economies such as Brazil. Restrictive laws in New Zealand are costing without bringing tangible advantages – a much wider science-based debate is required.

Need for more capability:

Personnel skills development and investment in the development of talent in the sector are lagging behind those of strongly growing economies.⁵⁶ New Zealand is recognised as having world-class training of skilled and highly qualified personnel, but poor availability of experts to industry (Appendix 10). New Zealand also has a relatively disaggregated R&D capability.

Lack of capital:

Most New Zealand businesses are under-capitalised, and cannot raise sufficient funds in New Zealand to grow substantially – Synlait is a great example of this problem, needing to turn to overseas investment to backfill a lack of domestic support. Liberalisation of market access will attract new capital to New Zealand for value-adding opportunities. Much of this will be dependent on innovative people, relationships and entrepreneurialism.

Low level of overseas direct investment:

To achieve closer links to the customer and to capture a greater part of the value chain (as well as to gain an understanding of consumer needs), it is important to have an in-market presence that gets close to the customer. Too much of New Zealand's value is handed on at the border, for others to meet the market and take the profit. Value chains for major primary products are insufficiently connected, and most of the value is captured by non-New Zealand-controlled entities that manage critical parts of the value chain. For example, despite exporting meat to the United Kingdom for over 120 years, we own no major in-market processors.⁵⁷

Dominance of a small number of large firms and an absence of mid-sized firms:

There is great disparity in the size of the businesses that participate in the sector, with a few large players (five with turnover greater than \$1 billion), a relatively small number of medium-sized players (about 40 in the range \$20 million–\$1 billion) and a large number of small players (estimates range from over 1,000 to 80,000, depending on definitions). It is the medium-sized players that have the real potential to grow into large companies but most do not have the vision or ambition to export and/or grow significantly. Consequently, the potential to produce real growth in the timeframes we are considering is concentrated in only a small number of players.

OPPORTUNITIES

Emerging economies:

The BRICS countries and others, such as Indonesia, Turkey and Mexico, are large emerging economies. The grouping known as the E7 (Brazil, Russia, India, China, Indonesia, Mexico and Turkey) is expected to eclipse the G7 in terms of GDP by 2020 (Appendix 3). As people in these economies have more money, we can expect spending on food to change from spending on grain products to spending on protein products (Bennett's Law). In 2011, the Asia-Pacific region had the fastest projected growth in food and beverage consumption (CAGR 7%) followed by Latin America (6%).⁵⁸ The global need for animal protein is forecast to rise by 100% by 2050, driven by population growth and changing food consumption patterns in developing economies.⁵⁹ There is also a significant aging of the population in many countries.⁶⁰

New Zealand is in the business of producing protein foods and can address these new economies in two ways:

- Firstly, by providing foods, beverages and ingredients into these economies (albeit initially small quantities compared with the emerging demand). The trick will be to tap into locally favoured, high returning food requirements and to capture as much of the value chain as possible;
- Secondly, by becoming involved in the development of production and manufacture of protein foods in these economies. New Zealand's involvements in the development of the dairy industries in Brazil⁶¹ and China are good examples of this.

55 The 2010 EU Industrial R&D Investment Scoreboard, October 2010. http://iri.jrc.ec.europa.eu/research/scoreboard_2010.htm.

56 New Zealand Department of Labour report to the Food & Beverage Taskforce.

57 Moving to the Centre: The Future of the New Zealand Food Industry. Coriolis Research Report to MED, October 2010. www.med.govt.nz/sectors-industries/food-beverage/pdf-docs-library/coriolis-report-pdf.

58 Expect the Unexpected: Building Business Value in a Changing World. KPMG International. www.kpmg.com/Global/en/IssuesAndInsights/ArticlesPublications/Documents/building-business-value.pdf.

59 World Agriculture: Towards 2030/2050, Interim Report. FAO, Rome, 2006. www.fao.org/fileadmin/user_upload/esag/docs/Interim_report_AT2050web.pdf.

60 World Population Prospects: The 2008 Revision. Population Division, UN Department of Economic and Social Affairs, 2009. www.un.org/esa/population/publications/wpp2008/wpp2008_highlights.pdf.

61 For example, Leite Verde. Brazil: A Land of Opportunities. www.mfat.govt.nz/Foreign-Relations/Latin-America/0-Brazil-a-land-of-opportunities/index.php.

The reality is that New Zealand is in a fundamental transition from feeding Westerners to feeding the Asia-Pacific and hence needs to make a major shift in focus. Coriolis Research notes “Imagine an alternative reality where New Zealand was colonised not by England but rather Japan or China. In this reality, New Zealand would produce very different foods and beverages. This is what the future potentially looks like”⁶².

Potential for growth:

Procter⁶³ summarises the potential for faster growth in the New Zealand economy as follows: “... if the New Zealand economy is to grow faster, it will have to restructure more quickly to higher value activities.

“This restructuring needs to build on New Zealand’s current comparative advantage in the agricultural and forestry and related industries by enhancing the value chain and the sophistication of the products it sells.

“The restructuring also needs to build from these strengths in agriculture and the emerging strengths in high-value knowledge-intensive (high income content) goods and services across all sectors where New Zealand has or can generate the requisite capabilities.

“If New Zealand is successful in restructuring more quickly, it will be apparent in a substantially greater share of exports to GDP, a share of business R&D in

GDP that is above the OECD average and an increase in the average business size.”

Increased awareness of the role of food in health:

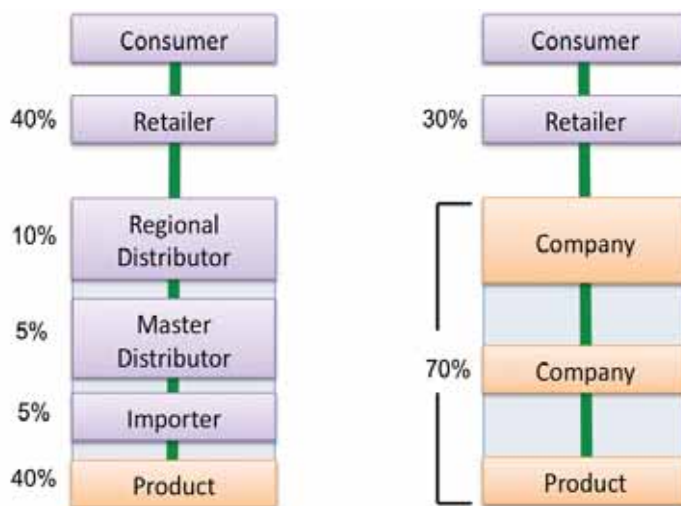
There is growing demand in all markets for smart ingredients plus affordable and healthy foods. New Zealand produces a range of foods that are considered by some to confer health benefits. Validation and substantiation of such health benefits (preferably through clinical trials) would satisfy regulators as well as add value in the eyes of the consumer and hence would produce greater returns to the producer and manufacturer.

Potential to capture more value from the value chain:

Much of New Zealand’s food offering is handed over at or before the border of target markets to offshore operators who capture a large proportion of the value. The opportunity is to own or control more of the value chain, getting the product closer to the consumer and capturing more of the value. Noting that supermarket chains control much of the foods that get to consumers, it is imperative that New Zealand’s transactions are directly with this end of the value chain or even directly with consumers.

This opportunity has many difficulties, including border tariffs and regulations, need for overseas direct investment to develop a New Zealand-owned in-market presence and difficulties in repatriating profits.

Taking greater control of a value chain:



Left: Product is sold to an importer, who then may reprocess before selling through to master and smaller regional wholesalers. The product price leaving New Zealand is 40% of that paid by the consumer.

Right: A direct to customer model maintains the existing final sales price, and has the potential to capture up to a further 30% of the product revenue. The net margin gain will be less because of the extra costs (perhaps half of the extra revenue) of the in-market distribution and assisting with promotional support, thereby reducing the retailer margin. “NZ Inc” must control these costs so that they do not exceed the margin.

62 Food & Beverage Information Project 2011. *Markets Stream – Global*. October 2011, p. 11. www.med.govt.nz/sectors-industries/food-beverage/pdf-docs-library/information-project/markets-global-2011.pdf.
 63 *Enhancing Productivity: Towards an Updated Action Agenda*. Procter R. MED Occasional Paper 11/01, March 2011. www.med.govt.nz/about-us/publications/publications-by-topic/occasional-papers/2011-occasional-papers/11-01-pdf/view.

Nevertheless, the potential upside can make it very worthwhile. Comvita is an example of a company that has successfully taken this path.

New Zealand could make more use of agri-food tourism, promoting local foods and beverages, and should exploit the reputation so gained by becoming the “Fortnum and Mason of world trade in high added value, high quality boutique gourmet type foods”.

Government-to-Government trade dealings can have an important role.

Potential to better meet consumers’ needs:

Much of New Zealand’s food production is relatively undifferentiated and traditional. There is a real opportunity for new thinking to develop new offerings that play to the needs and desires of consumers, through a better understanding of their requirements. This

particularly applies to ready-to-serve meals in both our mature markets and the rapidly growing developing markets. New Zealand has an educated and generally innovative workforce and is capable of developing IP-protected, technologically sophisticated food solution platforms designed to complement local cuisine – this is particularly important for the Asian markets, with different approaches to meals compared with our traditional European and North American markets. This requires New Zealand producers to better understand the functionality of non-New Zealand ingredients to provide meal solutions – curry, rice, spices etc.

Digital communication:

Increasingly, consumers shop online and find out about their food online. This allows New Zealand producers and manufacturers to develop relationships directly with consumers.

Comvita

“Natural health company Comvita’s sales in Asia are expanding by 20 percent year on year as a growing number of consumers look for products that are trusted, premium quality and underpinned by science.”



A Comvita store in Hong Kong

“Headquartered in Paengaroa in the Bay of Plenty, Comvita is the world’s largest manufacturer and marketer of manuka honey and produces natural health products for the wound care, healthcare, skincare and functional foods markets.

Asia has become a crucial market for Comvita, accounting for one third of the company’s global business.

It has over 250 outlets in more than 40 cities in China including concept stores within high-end Chinese department stores and China Duty Free shops in all the main centres.”

Source: <http://business.newzealand.com/china/en/buy-from-new-zealand/food-and-beverage/case-studies/comvita/> accessed March 2011.

Increasing urbanisation:

By 2010, more than half the world's population was living in urban areas, and this trend continues.⁶⁴ As the world's population becomes more urban, its ability to access locally produced fresh food diminishes. This creates a demand for "fresh" foods with enhanced shelf life. As a producer of high quality produce, New Zealand is well positioned to meet this need, provided the produce can be got to market in a suitable state.

Emerging technologies:

A number of food production and processing technologies that will make it easier to get "fresh" foods to distant markets are emerging. These include new genetics for fruit and vegetables that extend fresh shelf life, new ways of post-harvest handling to improve the keeping ability of produce and non-thermal processes that can provide pasteurised or even semi-sterilised foods without the detrimental effects of heating on organoleptic properties and perceived freshness. Some of these technologies are controversial in New Zealand because they can involve genetic modification or irradiation of food.

Of significant relevance is the ongoing introduction of technologies, globally, to address productivity and environmental footprints – for example, "since 1944, annual production of milk per cow has quadrupled in the United States, which means we need far fewer cows to meet the demand for milk. Consequently production of every gallon of milk in 2007 requires 65% less water and 90% less land than it did in 1944. 76% less manure is being produced for each gallon of milk sold. The "carbon footprint" for a gallon of milk in 2007 was 63% lower than it was in 1944"⁶⁵. A similar situation exists for beef.⁶⁶ New Zealand continues to be at the forefront of adoption of such technologies.

Opportunities to decrease inputs:

New Zealand has an opportunity for low impact options for inputs to farms, making better use, for example, of biological nitrogen fixation. Low input farming is in its infancy, but holds promise. Precision farming makes optimal use of traditional inputs.

Māori agri-food economy:

The Maori economy has significant primary industry assets (\$10.6 bn in 2010) that are not being used to their full potential. Maori interests have significant ambitions

to develop these assets and be a growing and major force in exports (see appendix 8)

Good positioning in traditional markets:

Despite changes in the world balance of economies, there is still a lot of money in our mature traditional markets. In these markets, the desire is increasingly not only for great taste and great story, for indulgence food or "weekend food", which New Zealand is well positioned to meet, but also for convenience food typically consumed on workdays: ready to eat, fast, right now, right price.⁶⁷ New Zealand must carefully manage how these two requirements are balanced and met by New Zealand-produced food. A "NZ Inc." positioning will play well to the first option.

Changing consumer needs:

Consumer needs are constantly changing, depending on socio-economic circumstances and political influences (e.g. new regulations), as well as in response to the introduction of new technology and its effects on lifestyle. Changing market dynamics also influence and change consumer needs – for example, the current move to healthy lifestyles and better nutrition.

*Processed foods:*⁶⁸

New Zealand has a strong group of domestic and international firms growing and achieving success in processed foods (e.g. baked goods, chocolate, frozen French fries, ice cream, infant formula, pet food, prepared fish, soup etc.). Exports in 2009 totalled \$1.7 billion with a CAGR of nearly 15% (non-inflation adjusted) for the last decade. Coriolis Research⁶⁹ proposes developing strategies for continued growth of such exports to Australia and expansion to the rest of the world, particularly Asia.

Increasing demands for environmental sustainability and animal welfare:

Greener growth brings major opportunities for the New Zealand economy and for the enhancement of the environment⁷⁰. This could provide a competitive edge for New Zealand if the concept is taken seriously, and not just paid lip service – New Zealand already has an international reputation for high standards of animal welfare and a pure green environment, and is investing heavily in an international consortium that is seeking to mitigate greenhouse gas emissions; New Zealand thus

64 *World Urbanization Prospects: The 2009 Revision*. Population Division, UN Department of Economic and Social Affairs. <http://esa.un.org/unpd/wup/index.htm>.

65 Capper J L, Cady R A & Bauman D E (2009). *The environmental impact of dairy production: 1944 compared with 2007*. *Journal of Animal Science*, 87, 2160–2167.

66 Capper J. *Comparing the Environmental Impact of the U.S. Beef Industry in 1977 to 2007*. Abstract presentation at the American Society of Animal Science meeting, July 2010. www.saiplatform.org/uploads/Library/1977%20vs%202007%20Beef%20Industry%20Environmental%20Impact%20-%20Capper.pdf.

67 Prof David Hughes, pers. comm.

68 *Moving to the Centre: The Future of the New Zealand Food Industry*. Coriolis Research Report to MED, October 2010. www.med.govt.nz/sectors-industries/food-beverage/pdf-docs-library/coriolis-report-pdf

69 Food & Beverage Information Project. *Sector Stream – Processed Foods*. October 2011. www.med.govt.nz/sectors-industries/food-beverage/pdf-docs-library/information-project/processed-foods-2011.pdf.

70 *Greening New Zealand's Growth*. Green Growth Advisory Group, December 2011. www.med.govt.nz/sectors-industries/environment/pdf-docs-library/Greening%20New%20Zealands%20Growth.pdf.

has credibility. This competitive edge can be enhanced if the story is properly told and if rogue operators are eliminated. New Zealand's pasture-based farming and hill-country-based meat production can be the basis for great stories about sustainable production. The fact that this production is water intensive does not matter if it is carried out in regions in which there is no shortage of water in the first place. Similarly, stories about provenance can add value to New Zealand-produced foods.

THREATS

High and volatile foreign exchange rate:

New Zealand's small economy and stable government make it a favoured place for overseas investors (partially as a result of the relatively high interest rate in New Zealand), leading to upward pressure on the foreign exchange rate. This disadvantages exporters, because it makes their products unduly expensive and potentially uncompetitive when prices are translated into foreign currencies. The volatility of the exchange rate, which results from fluctuating commodity prices and changing global market sentiment towards risky (high yielding) assets, makes it difficult for exporters and importers to plan.

Increasing cost and price instability of petrochemical energy:

This is a worldwide problem, and can provide

opportunities for New Zealand if it develops low impact alternatives.

New Zealand is no longer the lowest cost producer in some of our key exports.

Agri-business would benefit significantly from the development of relatively low cost alternative, and renewable, energy sources.

Increasing local production in target markets:

This is being driven off a desire for food security and environmental considerations, such as carbon footprints. In most large urban areas, this is a niche segment only, and is unlikely to become more unless urban farming becomes a more realistic prospect. Present energy considerations make this unlikely in the short term.

In developing countries with large capacity for production, such as China and Brazil, it is important for New Zealand to be part of their development.

Reducing demand for meat and dairy products:

Meat and dairy products are becoming less popular in developed nations – largely because of arguments about climate-friendly diets and the opportunity cost in terms of other food. The common argument is that 1 kg of meat takes away 10 kg of grain-based food. This argument is fallacious when applied to New Zealand production and must be rebutted. Meat and dairy products do

URBAN FARMING AND THE VERTICAL FARM

There has been considerable media attention to the potential of urban farming and the vertical farm. Urban farming requires the use of space – often on rooftops – to set up large hydroponic operations that can produce fresh produce at or close to the point of sale. Vertical farming takes this a step further and posits the development of multi-storey buildings for hydroponic production, sometimes with concomitant aquaculture.

Although this approach would appear to be eco-friendly and efficient (systems are contained and there is no runoff or waste of water or fertiliser chemicals; produce is produced close to point of sale, avoiding transport and storage/refrigeration costs), the full situation is less simple. Hydroponic production requires adequate light for plants to grow. This can be achieved in many environments (and certainly in vertical farms) only by artificial lighting or natural light supplemented with artificial lighting. Some critics have highlighted the energy needs posed by this, but there is a further issue: the kinds of lighting needed produce considerable amounts of heat as a by-product, and dispersal of this heat is an additional cost. Furthermore, these systems use significant quantities of energy-intensive chemicals such as ammonium salts or nitrates, albeit more efficiently than conventional intensive agriculture.

So what are the opportunities and threats from urban farming?

It is clear, and likely, that some urban production occurs now and will increase in the future. This is and will be primarily around fresh vegetables and is to be welcomed. Although such production is likely to provide fresh vegetable nutrition, it is unlikely to be a source of high density nutrition, such as is provided by cereals, or of high quality protein, such as is provided by animal protein. It is also unlikely to be a significant source of fruit, which requires trees or vines – a much more difficult proposition for hydroponics.

Vertical farming will require a new and abundant source of cheap renewable energy if it is to work. Perhaps the problems of fusion power will be solved in the next 40 years and make it viable.

The emphasis on local production of vegetables, in particular, will probably increase opportunities for accompanying high quality animal products, particularly dairy – an opportunity for New Zealand.

have a high price, but they have a correspondingly high nutritional value, because of better digestibility, a better ratio of protein to carbohydrate and a balance of essential amino acids. Hill country meat comes at no opportunity cost in terms of crops that might be produced off the same land, and arguments about the water cost are irrelevant if there is adequate rainfall and water is managed properly.

Agri-food competitors:

Other countries with similar climates, larger land areas and often cheaper input costs are also targeting the same markets as New Zealand with their export products and with not dissimilar strategies. It is imperative that New Zealand fully exploit its strengths and opportunities to win the race. Examples of serious competitors include Chile, South Africa and Australia, and Brazil is an emerging major competitor.⁷¹

Biosecurity risks:

Diseases and zoonoses will always be a threat. It is increasingly important to manage border risks effectively.

The brain drain:

Valuable researchers, entrepreneurs, innovators and other talented individuals are leaving New Zealand (see Appendix 10). Steps need to be taken to retain in and/or repatriate skilled and highly qualified people to New Zealand. Aspects such as repayment of student loans, relativity of salaries, taxes and standards of living need to be explored. This problem is not unique to the agri-food sector.

Increasing cost of regulatory compliance:

A major issue for New Zealand is the increasing cost of regulatory compliance without concomitant benefits. The impact of this will be greatly increased if, in the future, businesses are required to bear the full environmental costs of their operations – these costs, globally, have been

estimated⁷² at 220% of food sector earnings and 42% of beverage sector earnings. Although these are hypothetical figures, and the New Zealand position is likely to be less than the global position, they provide an indication of the potential value at stake.

Fertiliser use:

New Zealand exports substantial quantities of minerals and other elements in its food. The nitrogen is replaceable (albeit at an energy cost, reducible through biological nitrogen fixation), and we have adequate stocks of mineral calcium and magnesium. However, phosphate is a matter for concern. New Zealand has traditionally been heavily dependent on imported phosphate. Recent improvements in the use and uptake of phosphate, and more controlled application through precision agriculture, will limit its use to the minimum necessary; nevertheless, the phosphate that we export in food must be replaced from somewhere.

Loss of production base to urban sprawl:

Federated Farmers says that, although farmers are increasing yields by better methods, the overall area continues to shrink – 873,000 ha has been converted to lifestyle blocks.

“About 10 per cent of New Zealand’s most productive farmland is now occupied by lifestyle blocks, according to new research by Landcare.

The work by Landcare researchers Robbie Andrew and John Dymond showed lifestyle block numbers now numbered 175,000, an increase of 75,000 over the past 13 years and covered an area of 873,000 hectares.

Lifestyle blocks occupied 148,000ha (17 per cent) of high-class land, which was defined as land that could be used intensively to produce a wide variety of crops. That is 10 per cent of New Zealand’s total area of high-class land.”⁷³

71 Brazil will be capable of supplying almost half of the world’s beef within 10 years, according to the Brazilian Minister for Agriculture, Livestock and Supply, Jorge Mendes Ribeiro Filho. <http://www.globalmeatnews.com/Industry-Markets/Brazil-could-meet-half-of-global-meat-demand>

72 Expect the Unexpected: Building Business Value in a Changing World. KPMG International Report. www.kpmg.com/Global/en/IssuesAndInsights/ArticlesPublications/Documents/building-business-value.pdf.

73 Source: www.stuff.co.nz/business/farming/6302202/Issues-on-both-sides-of-the-fence-over-lifestyle-land, 24 January 2012.

APPENDIX 8: THE MĀORI ECONOMY

Agri-food businesses play a central role in the Maori economy^{74,75,76,77}. The BERL report⁷⁵ to the Maori Economic Taskforce (which was established in March 2009 as a result of the Maori Economic Summit) is cited⁷⁸ as a landmark in recognising the “Maori economy” as being economically important to New Zealand and a potential “game changer” in the Government’s Economic Growth Agenda.

This BERL report estimated the asset base (assets owned and income earned by Maori) of the Maori economy at \$36.9 billion (2010) (agriculture, forestry and fishing, \$10.6 billion) contributing \$10.3 billion (\$1.2 billion) to New Zealand’s GDP. There has been real growth over all these assets of about 11% per annum during the period 2001–2010 and they have further considerable potential with many of them still under-utilised.

There is a heavy concentration of Māori business assets in New Zealand’s dairy, meat and seafood sectors. MAF estimates that the contribution by Māori is approximately 15% of the national dairy production, 18–20% of beef and lamb production and 50%+ of seafood production.

A number of commercially focused clusters of scale now exist in the Māori primary sector and are becoming increasingly market facing and value chain oriented. Thus, the Māori economy is an important part of the agri-food domestic and export markets, and it has the potential to grow. BERL argued that there was compelling evidence of an opportunity for a step change in growth and that the resulting gains to Maori would also be significant gains to the New Zealand economy.

FoMA’s Primary Industries mission⁷⁸ is to lay the foundation and the roadmap to grow four \$1 billion revenue enterprises from Māori-owned interests in the primary industry, particularly dairy, red meat, horticulture and forestry. Some of the outcomes sought to contribute to economic growth are:

- increase the utilisation and productivity of Māori-owned primary industries production bases;
- develop innovative market demand products;
- orientate these production bases and innovative products to new value chains in which value capture is returned to New Zealand;
- build the required human capability; and

- leverage cultural connectedness internationally.

The Taskforce identified the use of comparative advantage as an important component of growth and cited leveraging of Māori cultural values, exploring the concept of Brand Maori and taking advantage of consumer responsiveness to distinctive cultural differences in foods and beverages.

The BERL report and the Maori Economic Taskforce identified a number of challenges for Maori and stressed the importance of:

- collaboration, leadership and scale;
- investment in science, innovation and technology;
- enhancing the quality and reputation of exporting; and
- raising productivity.

One of the scenarios in the BERL report highlighted the step change difference that could be expected between a science and innovation policy that is concentrated solely on funding the science sector and an effort that focuses on overcoming the communication, capability and commercialisation challenges faced by scientists, innovators and Māori entrepreneurs. A much greater return on R&D investment is obtained through active engagement and alignment, as opposed to a focus solely on funding.

Thus the issues facing the Maori economy mirror those of the New Zealand economy as a whole, with some distinctive differences relating to cultural aspects of the Māori worldview. Particular characteristics of the Māori economic sector include: Māori land does not have an open market, land retention is critical and there are restrictions on selling land; an outlook that is ultraconservative and capital gains have less importance than improving land utilisation, increasing productivity and cash yield while being environmentally sustainable, socially responsible and maintaining inter-generational accountability – “*what is our legacy for our children and their children’s children.*”

FoMA⁷⁸ sees Māori as critical to the future prosperity of New Zealand. Its emerging strategy is entitled **Kia Mahi Tahi Tatou – “all work together as one”**.

74 Much of this section is based on discussions with the Federation of Māori Authorities (FoMA), March 2012.

75 Nana G, Stokes F & Molano W. *The Māori Economy, Science and Innovation*. BERL Report to Māori Economic Taskforce, May 2011. www.tpk.govt.nz/_documents/taskforce/met-rep-ecosciinnovate-2011.pdf.

76 Owners’ Aspirations Regarding the Utilisation of Māori Land. Te Puni Kōkiri, April 2011. www.tpk.govt.nz/en/in-print/our-publications/publications/owners-aspirations-regarding-the-use-of-maori-land/page/21/.

77 *Māori Agribusiness in New Zealand: A Study of the Māori Freehold Land Resource*. MAF, March 2011. www.maf.govt.nz/news-resources/publications?title=Maori.

78 Federation of Māori Authorities (FoMA), personal communication, March 2011.

The following illustrates how one agri-food company in New Zealand is positioning itself to better capture more value from their product and value chain. It is used with permission, and has been modified so that the name of the company and the product are not revealed.

POSITIONING STATEMENT PREPARED BY COMPANY X

People

We need to build a global group of followers, who believe in the movement, the story of Company X, and New Zealand as a source of premium natural product and as a special destination. These people are affluent and aspirational, valuing performance brands over prestige. They like being ‘in the know’, are connected, are early adopters and are confident individuals. They are urban-dwellers, living in all major cities of the world. These consumers are currently eating similar products, but would prefer an alternative with superior health and sustainability attributes – just as long as it delivers on taste and mouthfeel. To build, educate and motivate the believers, we need to employ a top sales person in each target major city or territory to pull the product through from the consumer, chef or retailer, to carry out product tests and demonstrations, to create excitement and build sales.

Distribution

We will refine the model we have developed in [overseas market A] and New Zealand and roll this out to other markets. Each market (city) will be dealt with on a case-by-case basis as we establish our own in-house distribution capability. The in-market sales initiative is key to our direct-to-market approach and careful staff selection and management will be essential. A new position of International Market Manager will lead the establishment of each new market and drive expansion of the model.

Product

The main focus will be the premium end of the category marketed as a beautiful natural product. To reinforce this premium offer, we will create specifications and quality systems to meet our satisfaction guarantee.

Promotion

Our product will be strongly branded to the consumer, the niche retailer and to the chef. Using this brand, we

will employ a range of promotional channels to tell our story. Because we are marketing to early adopters, we need to be working with key endorsers (e.g. celebrity chefs) who support our product and movement and whose opinions are valued by our market segment. We need to develop promotional opportunities with these advocates, and use these to build a tribe of believers via stories/mythology told on social media and the website. These activities will get people talking about the movement. To back up these PR and new media channels, we will also develop promotional materials detailing product characteristics and USP’s to support our story at tradeshow, in-store demonstrations and other similar events.

Price

Our product will be priced at a premium above the best of the products in the market that sets the current global benchmark. This places most of our product at a price 100% above standard product pricing from New Zealand and potentially 200% above for our top product. We will support this price level by consistent delivery and engagement with consumers.

Place

The product will be served as a premium product in top end restaurants and stocked in niche retail stores that specialize in a high level of service to their ‘foodie’ customers.

We also propose an e-commerce or other direct-to-consumer channel that would act as a ‘club’ for dedicated consumers. To date, our experience has indicated that there are individuals who greatly appreciate the ability to communicate directly with suppliers of their favourite specialty foods (and other consumer products). They value the ability to discuss the product, share ideas and knowledge and generally be ‘in the know’. Websites utilizing blogging and other social media tools enable this two-way communication, with the added benefit of sharing knowledge amongst the wider group of club members or ‘fans’.

In addressing the capability needs of New Zealand, it is instructive to review some statistics from the Global Competitiveness Index, shown in Table 10.1 (data from World Economic Forum⁷⁹). These statistics have been selected because they are most relevant to the development of industry.

New Zealand's education systems score and rank well, better than Australia's (Pillars 4 and 5). *Technological readiness* (ability to take up new technologies) scores lower (largely because of poor internet bandwidth and foreign direct investment in technology transfer – data not shown), but the key supporting statistic, firm-level technology absorption, is a respectable ranking of 17th, ahead of Australia. It is worth noting that countries ranking significantly higher than New Zealand in Pillar 9, Technological readiness, score much higher in internet bandwidth and use of broadband compared with New Zealand (data not shown).

The problem area appears to be highlighted under the Innovation pillar (all supporting statistics shown), with three statistics standing out as problem areas for New Zealand. These are:

- Company spend on R&D – 38th. This is an area that is frequently highlighted by Government and other

commentators and still needs attention. The issue of research intensity is dealt with in Appendix 11;

- Government procurement of advanced technology – 73rd; and
- Availability of scientists and engineers – 67th.

The statistic about Government procurement of advanced technology can be explained in part by the fact that we do not have a major defence capability (which would require substantial spend on advanced technologies); however, it also highlights Government sluggishness in meeting other needs, such as high bandwidth internet – which are key enablers of overall development – and it has already been noted that New Zealand scores poorly with respect to internet use. We note the current efforts of Government to improve broadband speeds in New Zealand but also note that competitors are not standing still. It is also worth noting that the rural community is the production

	Descriptor	NZ Score (1–7)	New Zealand	Australia	Canada	Denmark	Netherlands	Finland	Israel
Factor			Ranking (of 139)						
Overall		4.9	23	16	10	9	8	7	24
Pillar 4	Health and Primary education	6.6	5	13	6	20	8	2	46
Pillar 5	Higher education	5.5	13	14	8	3	10	1	33
Pillar 9	Technological readiness	4.9	25	23	16	6	3	15	26
9.02	Firm-level technology absorption	5.9	17	19	22	13	25	12	7
Pillar 12	Innovation	4.0	24	21	11	10	13	3	6
12.01	Capacity for innovation	3.9	28	23	19	9	10	5	7
12.02	Quality of science institutions	5.3	14	10	8	12	9	13	1
12.03	Company spend on R&D	3.6	38	23	20	7	15	5	11
12.04	University–industry collaboration in R&D	4.9	21	13	7	8	11	3	14
12.05	Government procurement of advanced technology	3.6	73	37	26	9	24	6	20
12.06	Availability of scientists and engineers	4.1	67	45	6	19	22	1	17
12.07	Utility patents (per million population)	(29.5)	24	17	10	15	13	6	4

Table 10.1: Global Competitiveness Index 2010–11: selected rankings and scores for New Zealand and comparator countries. Rankings highlighted under Pillar 12 are considered to confer notable competitive advantage.

⁷⁹ *The Global Competitiveness Report 2010–2011*. World Economic Forum, 2010. www.weforum.org/issues/global-competitiveness. Note that this link will always link to the latest report, and earlier reports can be found in the archive.

Country	Life Sciences	Physical Sciences	Mathematics and Statistics	Computing	Engineering and Engineering Trades	Manufacturing and Processing	Agriculture
Finland	2.43	3.60	1.42	5.74	13.24	1.14	2.54
Netherlands	0.61	0.71	0.22	2.94	2.81	0.31	1.04
Denmark	1.53	1.27	0.80	2.38	4.98	0.23	0.97
Australia	3.84	2.28	0.55	6.44	4.29	0.76	0.86
New Zealand	5.44	2.14	1.20	3.74	4.13	0.39	0.72
Israel	3.12	1.76	1.10	1.86	5.06	1.89	0.60

Table 10.2: Graduates by field per 10,000 population, selected fields⁸⁰.

base for our food industry, and access to broadband internet in New Zealand can be poor to non-existent in many rural areas.

Of more concern, however, is that we appear to have first-class educational capability, but firms do not have adequate access to scientists and engineers. This raises the question of whether we are training graduates in the right fields. The breakdown of graduates in relevant science and engineering fields in New Zealand is compared with that in some other countries in Table 10.2. The figures for New Zealand are not dissimilar to those of the other countries (with the exception of Finland), although the figure for agriculture is lower than might be expected. These statistics do not suggest a dearth of graduates in science and engineering of a 65th ranking country.

A more likely explanation of the gap is that, although we are training the graduates in the right fields, we are not retaining them. OECD data [31] show 24 per cent of New Zealand-born highly-skilled personnel are leaving New Zealand and not returning; the comparable figure for Australia is 3%. Moreover in New Zealand immigration of highly skilled people is about equal to those emigrating, whereas in Australia immigrants outnumber emigrants by about 15:1. There is a plethora of anecdotal evidence of loss of scientists overseas, and Government initiatives to repatriate them have had modest success at best. The problems in the science system in New Zealand that lead to loss of graduates are well known and have been reported by several groups. These problems include:

- Lack of a proper career structure for scientists;
- Uncompetitive salaries and tax structures;
- Inability to pursue a line of research over an extended period of time;
- Lack of a public positive perception of scientists (particularly in contrast with other OECD countries).

The problem was exemplified as recently as the day of writing this appendix, with a quote: *“People go overseas because they can get better salaries and better opportunities to*

continue their research.” Professor Jane Harding, radio interview, 27/10/2011. And by a further quote from a Lincoln University professor: *“I was recently in New York with 15 graduates from Lincoln in their mid to late 20s who will not come back to New Zealand with the current tax regime.”*

If the food industry is to be better served by scientists and engineers, there needs to be more attention to training and retaining more engineers and scientists with relevant areas of knowledge and skill.

Procter⁸¹ notes:

“Technical skills include skills in science, mathematics, technology and engineering. In terms of technical skills, New Zealand is close to the top of the OECD in science graduates per million population but close to the bottom in terms of engineering graduates. For PhD graduation rates, New Zealand ranks around the middle of the OECD in science but towards the bottom in engineering.

“And New Zealand academics in disciplines that have the best market salaries and opportunities are paid the lowest amount relative to those market salaries. The result is that the worst research (relative to international best practice) is in the most market relevant disciplines, and vice versa (Boyle⁸²). This suggests New Zealand’s university education is likely to be weakest in the skills most relevant to business. If university research and teaching were aligned with New Zealand’s growth strategy, the opposite would be the case.”

If we are to increase research intensity to the 2% target proposed, this will mean a requirement to increase the existing number of scientists and engineers immediately – about another 1600 FTEs, rising to 2600 as the food industry trebles in value by 2025 (based on a spend of \$250,000 per fully funded scientist/engineer). This implies increasing the number of science and engineering graduates by nearly 400 per year for the R&D sector only; more will be required, probably a similar number, to meet the needs of industry and Government if we are to meet the challenges. And those graduates must be the products of a teaching and research environment that is consistent with New Zealand’s growth strategy.

80 OECD. Stat Extracts. <http://stats.oecd.org/Index.aspx>. Accessed 02 August and 27 October 2011.

81 Procter R. *Enhancing Productivity: Towards an Updated Action Agenda*. MED Occasional Paper 11/01, March 2011. www.med.govt.nz/about-us/publications/publications-by-topic/occasional-papers/2011-occasional-papers/11-01-pdf/view.

82 Boyle G (2008) *Pay peanuts and get monkeys?* Evidence from academia. B.E. Journal of Economic Analysis and Policy, 8(1). doi:10.2202/1935-1682.1976.

Research intensity is calculated as expenditure on R&D relative to income. For countries, it is usually expressed as R&D expenditure/GDP; for companies, it is expressed as R&D expenditure/net sales. Research intensity is a robust statistic because, as it compares dollars of the day with dollars of the day, it is independent of exchange rate variations and inflation.

There is a clear link between investment in R&D and economic growth. Economic growth is generally low when expenditure on R&D is low; within a sector, businesses with higher research intensities generally have higher growth⁸³ rates, revenues and profits.

Pharmaceuticals & Biotechnology	15.0
Software	10.7
IT Hardware	8.6
Health	6.6
Leisure & Hotels	5.7
Electronics & Electrical Equipment	5.5
Automobiles	4.3
Aerospace	3.8
Chemicals	3.7
Personal Care & Household Goods	2.9
Engineering	2.5
Food	1.8
Beverages	1.7
Telecommunications	1.5
Construction	1.0
Steel, Metals	0.9
Banks	0.7
Forestry & Paper	0.5
Oil & Gas	0.3

Table 11.1: Research intensities (as % of sales for 2004–05). Top 1000 global companies, by sector⁸⁴.

The data in this table are weighted averages.

Table 11.1 indicates a wide range of research intensities between different sectors for 2004–05. As these statistics are for the top 1000 global companies, they focus on large, successful companies. Foods and beverages are given separately at 1.8% and 1.7% respectively.

Table 11.2 comes from a study in Italy⁸⁵ (original not available) and has been quoted in *The Crisis of Food Brands*⁸⁶. It compares research intensity between the food and pharmaceutical industries by size of company. From this, it is clear that only large companies engage seriously in R&D, with intensities ranging from 1.7 to 5.9%.

Size (No Employees)	Research Intensity in the Food Industry			
	1–499	500–999	> 1000	All sizes
France	0.7	0.2	2.8	1.0
Germany	0.2	0.5	2.3	0.5
Italy	0.2	0.4	1.7	0.4
UK	0.4	0.4	1.8	0.9
USA	0.1	0.2	5.9	1.2

Table 11.2: Research intensity by country and company size for the food industry for selected countries in 2004.

The data in Table 11.3 are aggregated data for a selection of large food and beverage companies (turnover > 250 million Euros) in a range of EU and non-EU countries in 2009. Interestingly, New Zealand is included in this data set, although only one company is listed (Fonterra). All companies in this analysis, except one, had more than 1000 employees.

83 Bravo-Ortega C & Garcia Marin A F (2011) *R&D and productivity: a two way avenue?* World Development, 39, 1090–1107.

Van Pottelsberghe B & Guellec D (2004) From R&D to productivity growth: do the institutional settings and the sources of funds of R&D matter? Oxford Bulletin of Economics and Statistics, 66, 353–378.

Ulku H (2007) *R&D, innovation and growth: evidence from four manufacturing sectors in OECD countries.* Oxford Economic Papers, 59, 513–535.

84 The 2005 R&D Scoreboard: *The Top 750 UK and 1000 Global Companies by R&D Investment.* Department of Trade and Industry, UK Government, 2005. www.berr.gov.uk/files/file10559.pdf

85 Foresti G (2005) *Specializzazione produttiva e struttura dimensionale delle imprese: come spiegare la limitata attivita di ricerca dell'industria italiana.* Rivista di Politica Economica, XCV (3–4), 81–122.

86 Esposti R (2009) *Solving the controversy between functional and natural food: is agri-food production becoming modular?* In *The Crisis of Food Brands* (Lindgreen A, Hingley M K & Vanhamme J, Eds), Chapter 9, pp. 139–154. Gower Publishing, Farnham, Surrey, UK.

Country	Research Intensity (2009)	Companies
Ireland	2.2	3
Japan	2.1	10
Switzerland	2.0	2
France	1.8	4
Germany	1.5	3
UK	1.4	11
USA	1.3	9
Denmark	1.2	2
Finland	0.7	4
The Netherlands	0.7	4
New Zealand	0.6	1
Belgium	0.4	2
Spain	0.4	2

Table 11.3: Research intensity (R&D expenditure/net sales) for large food and beverage companies in selected countries in 2009 – EU data. Data selected and calculated from the 2010 *EU Industrial R&D Investment Scoreboard*.⁸⁷

Because of the wide variety of companies, it is also instructive to compare figures for specific companies. (Table 11.4).

A RECIPE FOR GROWTH FOR NEW ZEALAND

New Zealand is a small country, with the value of total exports similar to the net sales of Danone. As a food company, New Zealand would rank about 8th in the world, behind the likes of Nestlé, Unilever, Kraft and PepsiCo. Furthermore, about half of New Zealand's food exports come from one company, Fonterra.

Gluckman⁸⁸ points out that New Zealand (all industries) invests about 1.2% of GDP on R&D compared with 2–3 times that in other countries. He suggests that industry should raise its R&D investment to 1–3% of revenue/GDP. He also estimates that, if New Zealand had spent about the same as Denmark on R&D over the period 1980–2010, we would have spent an additional \$35 billion; we thus have a considerable historical deficit compared with a successful comparator country.

It is not straightforward to calculate expenditure by the New Zealand agri-business sector.

“Comparing reported R&D in New Zealand with that of other countries is a real issue because of likely distortions arising from different treatments of tax on R&D. Because

Company	Country	R&D/Net Sales Ratio %
Monsanto	USA	9.4
Danisco	Denmark	6.0
Kerry	Ireland	3.3
Kirin	Japan	3.2
Yakult Honsha	Japan	3.2
Ajinomoto	Japan	2.8
Unilever	UK	2.2
Nestlé	Switzerland	2.1
Campbell Soup	USA	1.5
General Mills	USA	1.5
Kellogg	USA	1.4
Danone	France	1.4
Cadbury (now part of Kraft Foods)	UK	1.2
Kraft Foods	USA	1.2
Valio	Finland	1.0
Kikkoman	Japan	1.0
PepsiCo	USA	1.0
Fonterra Co-operative Group	New Zealand	0.6

Table 11.4: Research intensity for selected large global food companies.

*there are no tax incentives on R&D in New Zealand it is likely that a proportion of R&D expenditure is expensed and not recorded as R&D. In contrast, in many competitor countries tax breaks are offered for R&D thus incentivising full reporting of R&D expenditure. As a result little can be drawn from direct international comparisons”.*⁸⁹

A statement from one person during the preparation of this report bears this out – *“we don't bother to separately record R&D spend; it just gets absorbed in engineering, new product development, marketing and operations. My estimate of research intensity for us is around 3%”.*

In 2009, the MoRST Food Research Roadmap estimated Government spend on food and beverage R&D as \$123 million from Government and \$196 million from private enterprise.

Our best estimate (from a variety of sources, including personal communication) is a current (2011) agri-food R&D investment of \$150 million (0.39%) from Government and \$200 million (0.53%) from private enterprise, noting that official figures for industry are based on Statistics New Zealand data⁹⁰ and exclude

87 The 2010 EU Industrial R&D Investment Scoreboard. IRI – *Economics of Industrial Research & Innovation*. http://iri.jrc.ec.europa.eu/research/scoreboard_2010.htm. Accessed October 2011.

88 Gluckman P D (2010) *Challenges facing New Zealand science*. *New Zealand Science Review*, 67 (3), 80–82.

89 *R&D, intellectual property protection and quality practices*. In *Economic Evaluation of the Food Processing Sector*, pp. 107–108, November 2003. www.infometrics.co.nz/reports/food-processing-review.pdf.

90 *Research and Development Survey: 2010*. Statistics New Zealand, March 2011. www.stats.govt.nz/browse_for_stats/businesses/research_and_development/ResearchandDevelopmentSurvey_HOTP2010.aspx. Accessed 20 October 2011.

expenditure overseas (for Fonterra, at least, this is significant). We have made no attempt to estimate R&D that is not separately recorded in company accounts.

Based on total agri-food industry revenue of \$38 billion (Coriolis Research), \$350 million is a research intensity of 0.92%.

If New Zealand is to become a world-class, innovative food producer, it needs to grow the industry aggressively (competitors are not standing still!) and should be spending at least 2% of total revenue (not just export

revenue) on agri-food R&D. This equates to \$750 million/year (2011 dollars), more than double the current spend. Procter⁹¹ gives a similar figure. Given the historical deficit noted above, a target of \$1 billion/year within 5 years seems to be necessary.

We would expect much of the proposed increase in R&D investment to come from industry although Government has a role in expediting and encouraging agri-business in New Zealand to increase its investment in R&D.

91 Procter R. *Enhancing Productivity: Towards an Updated Action Agenda*. MED Occasional Paper 11/01, March 2011. www.med.govt.nz/about-us/publications/publications-by-topic/occasional-papers/2011-occasional-papers/11-01-pdf/view.

APPENDIX 12: EMERGING TECHNOLOGIES

The following have previously been identified as areas of opportunity for New Zealand food research, science and technology.⁹² A useful treatment of emerging technologies is given in a special volume of *Innovation: Management Policy & Practice* (Volume 10, 2008).

- Production technologies – leverage strengths in molecular genetics for selective breeding – watch for a “tipping point” for consumer acceptance of genetic engineering – build on strengths in precision agriculture.
- Novel preservation technologies that will allow “fresh-to-market” characteristics – high pressure processing will be important, but keep a watch on cold plasma and watch for a tipping point for consumer acceptance of food irradiation.
- Enzyme processing – monitor public awareness and acceptance of recombinant enzymes and build on existing strengths using enzymes in food processing.
- Nanotechnologies are projected to have considerable impact on the food industry and will potentially offer benefits in food safety, storage, packaging, sensors, food formulation and nutrition.
- Novel food structures will be important for the future for food sensory and health characteristics.
- Supply chain – traceability, radio-frequency identification and beyond, smart packaging and sustainable packaging will all offer opportunities. Note that New Zealand has limited strengths in packaging science in one CRI and one research association, and a small research and teaching capability at Massey University. This capability needs to be developed.
- Processing – need to have clear regulations around genetically engineered enzymes as processing aids, to avoid international regulatory and perception problems – watching brief on new technologies from other industries that can be adopted and adapted.
- Biotechnology, artificial intelligence, IT, new materials, personal nutrition.

- Integrating social and consumer sciences with technological development.
-

The following is a list provided by Professor Jim Harper (Ohio State University).

1. High pressure processing
2. Non-thermal processing for fresh flavours.
3. Elimination of wiring in factories⁹³.
4. Ultrasonics.⁹⁴
5. Microwave drying of fruits and vegetables⁹⁵.
6. Nanoparticles is a developing field that needs to have a watching brief. There are many opportunities⁹⁶.
7. Cold plasma for microbial inactivation. This is a relatively new way of inactivation of a range of microorganisms.⁹⁷
8. Ozone as a replacement for chlorine. Ohio State is working on the use of ozone to inactivate *Salmonella* in whole eggs⁹⁸, which is starting to go commercial, and as an effective sanitiser against biofilms following CIP.
9. Healthy aging. There are several things that appear to be important:
 - a. Reports that, since 1940, there has been a linear increase in the developed countries in life expectancy of 0.2 years per year, with no indication of the trend slowing down.
 - b. Two of the major areas that decrease healthy aging are sarcopenia and atherosclerosis, both related to protein nutrition.
 - c. Recommendation that high quality protein intake be increased.
 - d. Literature supporting the view that the loss of muscle and muscle function may not be related. Leucine, known to help with muscle recovery in athletes, may also be involved in improving

92 Adapted from a paper by M Boland prepared for the MoRST Food Research Roadmap.

93 Ruiz-Garcia L, Lunadei L, Barreiro P & Robla I (2009). *A review of wireless sensor technologies and applications in agriculture and food industry: state of the art and current trends*. *Sensors* 9, 4728–4750.

94 Knorr D, Zenker M, Heinz V & Lee D (2004) *Applications and potential of ultrasonics in food processing*. *Trends in Food Science and Technology*, 15, 261–266.

95 Zhang M, Tang J, Mujumdar A S & Wang S (2006) *Trends in microwave-related drying of fruits and vegetables*. *Trends in Food Science and Technology*, 17, 524–534.

96 Dickinson E (2012) *Use of nanoparticles and microparticles in the formation and stabilization of food emulsions*. *Trends in Food Science and Technology*, 24, 4–12.

97 Niemira B A & Sites J (2008) *Cold plasma inactivates Salmonella Stanley and Escherichia coli O157:H7 inoculated on golden delicious apples*. *Journal of Food Protection*, 71, 1357–1365.

98 Perry J J, Rodriguez-Romo L A & Yousef A E (2008) *Inactivation of Salmonella enterica serovar enteritidis in shell eggs by sequential application of heat and ozone*. *Letters in Applied Microbiology*, 46, 620–625.

muscle function in people over 60 and even over 80. This disconnect between loss of muscle and muscle function may be associated with the role of high quality protein to alter the myosin isomers. Of interest in this respect is the ability of fish to change the active myosin isomer as a function of water temperature. Speculative, but I think worthy of continued attention.

Professor Gluckman and others have recommended the establishment of a strong capability to support the production of high value, clinically validated food and beverage products (consumer and ingredient) for health and wellness.^{99,100} An essential feature of this capability will be the ability to support label claims by clinical proof of efficacy. Such an approach may address the low commercial success rate of foods targeting health and wellness benefits.¹⁰¹ The capability will bring together

industry, research organisations, medical schools, food regulators and health authorities. New Zealand should become a world leader for providing foods and capability in this discipline. New Zealand already has competitive advantage because there is a lot of interaction between the agricultural and medical research communities.¹⁰² A key focus will be assessing what can be learned from nutrigenomics and epigenetics to understand both the beneficial and adverse health consequences of food. There is a requirement for a regulatory framework for credible substantiation of health claims, perhaps around markers and phenotyping. As New Zealand is seen as a leader in food regulations, other jurisdictions will watch and emulate what we are doing.

We note also the importance of social sciences when it comes to understanding consumer behaviour and support the development of this area.

99 Gluckman P D (2010) *Challenges facing New Zealand science*. New Zealand Science Review, 67 (3), 80–82.

100 Note that New Zealand is already working in this area, as evidenced by this press announcement of 22 November 2011 – “The EpiGen Consortium, an international alliance of the world’s leading epigenetics researchers (AgResearch Limited, Auckland UniServices Limited, Singapore Institute for Clinical Sciences of the Agency for Science, Technology and Research (A*STAR), and National University of Singapore, University of Southampton, Medical Research Council – Lifecourse Epidemiology Unit) is pleased to announce the creation of a research collaboration with Nestlé Research Centre in Switzerland”. Such activities should be increased significantly. www.agresearch.co.nz/news/Pages/default.aspx.

101 Mellentin J. *Key Trends in R&D in Relation to Food, Beverages, Nutrition & Health. What these Trends Mean for NZ*. New Nutrition Business, June 2011. www.med.govt.nz/sectors-industries/food-beverage/pdf-docs-library/information-project/innovation-overview-2011.pdf.

102 For example, see *A Healthy Start for Productive Lives*. National Research Centre for Growth and Development, 2011. www.nrcgd.org.nz/home.htm.

The mission of Wageningen UR (University & Research centre) is:

“To explore the potential of nature to improve the quality of life”.

Wageningen UR joins the forces of specialised research institutes, Wageningen University and Van Hall Larenstein University of Applied Sciences, while each retains its separate legal identity. This union of expertise leads to scientific breakthroughs that can quickly be put into practice and be incorporated into education. This is the Wageningen Approach.¹⁰³

The domain of Wageningen UR consists of three related core areas:

- *Food and food production*

The production and supply side in the food chain: sustainable agriculture/horticulture and fisheries/aquaculture, international food chains and networks, health aspects of food and the use of biomass within the scope of a bio based economy.

- *Living environment*

Nature, landscape, land usage, adaptation to climate change, water and ocean management, and the various competing claims on space. This also includes biodiversity and the sustainability of management and production.

- *Health, lifestyle and livelihood*

The influence of people's behavioural choices regarding health, food and living environment. The behaviour of consumers, citizens or recreational participants, the attitude towards risks and uncertainty, the perception of quality and safety, and the relationship between food safety and poverty, particularly in developing countries.

Wageningen UR has branches all over The Netherlands and in China and Brazil. A large number of lecturers, researchers and other employees are based at Wageningen Campus.

KEY FACTS

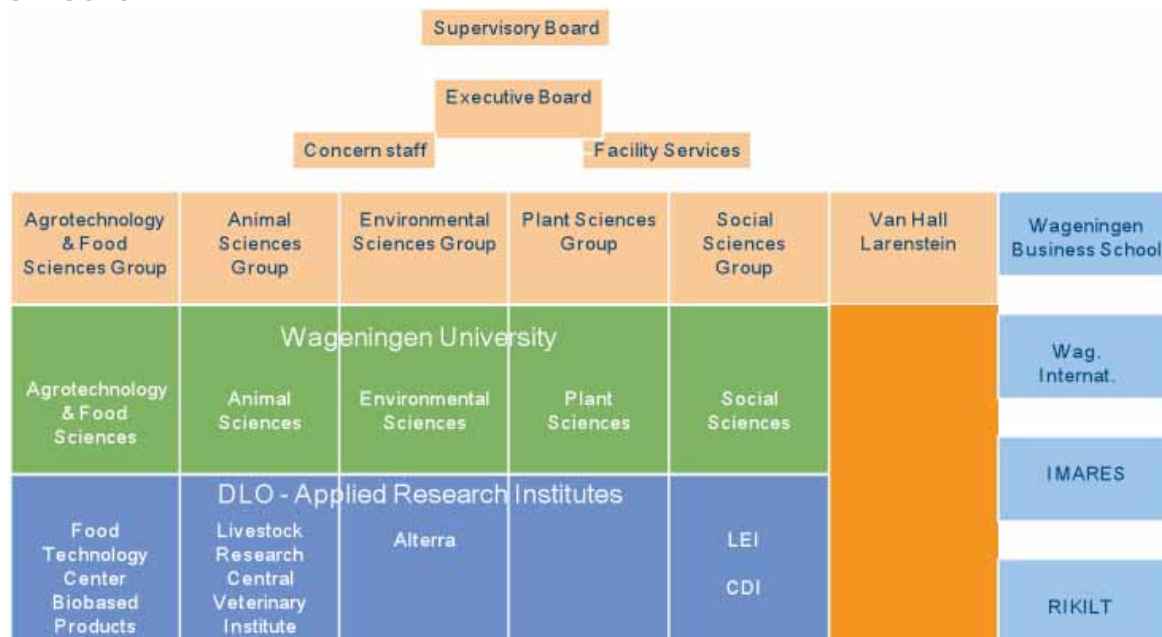
- Established in 1998
- Three pillars:
 - Wageningen University
 - Van Hall Larenstein University of Applied Sciences
 - CRO (Contract Research Organisations), – nine Applied Research Institutes
- Domain: healthy food and living environments (including the entire food production chain)
- Gross return in 2010, €710 million;
- 6500 employees (WU 2950, VHL 550, CRO 3,000);
- 11,500 students from > 125 countries
- 30 locations in Netherlands, Brazil, Chile, China and Africa; based in the Netherlands.
- Extensive international network
- Active partner in the Wageningen Food Valley Organisation (www.foodvalley.nl).

FUNDING

- Commercial Research Organisations €380M
 - 45% from NL Government (Ministry of Economics, Agriculture & Innovation)
 - 55% from other stakeholders (including private sector).
- Wageningen University €300M
 - 65% from NL Government (Ministry of Economics, Agriculture & Innovation)
 - 35% from Science funding (PhDs, Post-docs)
- Van Hall Larenstein €50M
 - 75% from NL Government (Ministry of Economics, Agriculture & Innovation)
 - 25% other sources (applied research)

¹⁰³ This section has been prepared from material from Dijkhuizen A (2010) *Innovation: key to future agri-food production*. New Zealand Science Review, 67 (3), 76–79, documentation on the Wageningen UR web site www.wur.nl/UK/about/ and material kindly supplied by Professor Dijkhuizen.

STRUCTURE



Wageningen UR includes 3 separate entities:

- Wageningen University;
- Van Hall Larenstein University of Applied Sciences;
- CRO (Contract Research Organisations), with 9 applied Institutes.

The result is an organisation in which education has been combined with fundamental research, application-driven research and practical research in a single, synergetic science chain. This co-operation has been given shape in six units, including five Sciences Groups. One department of Wageningen University has been functionally integrated in each Sciences Group with one or more former DLO institutes. The sixth unit, Van Hall Larenstein University of Applied Sciences, operates as an independent organisational component inside Wageningen UR, within the corporate framework established by the Executive Board. The co-operation focusses primarily on the educational aspects. Wageningen UR also includes Wageningen International, IMARES, Wageningen Business School and RIKILT. The key to the integration is that the member institutions retain their separate legal identity, thereby preserving their specific roles and funding entitlements, but operate under a single governance and executive structure.

WORLDWIDE PARTNERING ON GLOBAL (FOOD) ISSUES

- INRA (Europe)
- Embrapa and University of São Paulo (Brazil)
- INIA and University of Chile (Chile)
- CAAS, various universities (China)
- University of California, Davis (USA)
- Massey University (New Zealand)
 - *Proteos (novel approaches in sustainable protein supply)*
 - *project under development with Riddet Institute*
- Active partner in the Global Research Alliance on Agricultural and Greenhouse Gases.

STRONG DOMAINS IN GENERAL

- Food and nutrition science
- Functional foods
- Food safety
- Breeding and genomics
- Plant breeding/seedlings technology
- Dairy processing technology
- Glasshouse technology
- Nanotechnology in food applications
- Biodiesel/biomass technology
- Agro logistics.

APPENDIX 14:
AGRI-FOOD STRATEGY RISK ANALYSIS

Risk Area	Consequence	Mitigation
Political		
-Regulatory costs and constraints	Uncompetitive cost structures and missed opportunities	Regular review of regulations (Resource Management Act, Hazardous Substances and New Organisms Act)
-Trade barriers	Restricted market access	Pro-active trade negotiations
-Leadership	Strategy fails	Industry leadership and Government sanction of food strategy
-Immigration	Capability and labour shortfalls	Business-friendly immigration policy
-International stability	Instability reduces demand	Diversified markets
Economic		
-International economy	Stagnant economies reduce demand	Diversified markets
-Investment capital	Inadequate capital investment restricts growth and productivity	Fiscal and monetary and overseas investment policies
-Tax settings	Poor settings discourage investment and productivity	Tax settings favourable for business investment and growth
-Exchange rate	High exchange rate reduces profitability and competitiveness	Economic management and monetary policy
Environmental		
-Energy costs	Reduce competitiveness	Energy policy
-Water availability	Restricts production	Water policy
-Biosecurity incursions	Reduce production and limit market access	Border security and phytosanitary rules
-Climate change	Extreme events increase costs and reduce production	Emergency response planning and preparedness
Social		
-Brain drain	Skill shortages	Desirable living standards
-New Zealand image	Poor image undermines marketing	Align facts and public relations
-New Zealand culture	Restricts commercial growth and productivity	Education and business “heroes”
Technological		
-Research infrastructure	Reduced R&D capability	Investment in facilities and equipment
-IP capture	Lost opportunities	IP law and simple registration process
-Capability	Lost opportunities	Targeted investment in tertiary education
-Funding	Lack of innovation	Targeted and benchmark levels of R&D funding
-Commercialisation	Lost opportunities	Commercial incentives to invest; Venture capital, incentives and entrepreneurship

Further copies of this report
can be obtained from the Riddet Institute

Email: info@riddet.ac.nz

Electronic copies can be accessed via

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