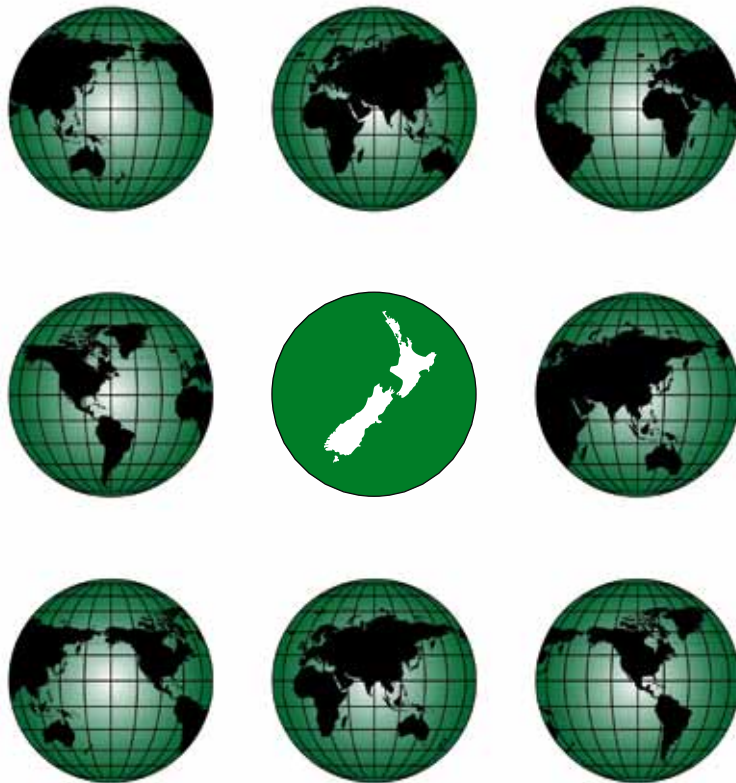




**DRIVING  
ECONOMIC GROWTH  
THROUGH **BIO-BASED**  
INDUSTRIES**



THE 2009 BIOECONOMY  
INDUSTRY SUMMIT REPORT



NZBIO would like to acknowledge the support of:



MINISTRY OF  
RESEARCH  
SCIENCE +  
TECHNOLOGY



***“ More than 70% of New Zealand’s export earnings are derived from biology-based industries spanning human and animal health, agriculture, horticulture and other natural products. Exports include finished products and ingredients destined for the food, cosmetics, nutraceutical and pharmaceutical industries. ”***

Source: <http://www.naturalproductsnz.org/about.htm>

***“ It’s my view that we need to put science at the heart of this National-led Government. If we don’t do that we are simply not going to get the economic gains that New Zealand needs and we won’t have the standard of living that we deserve. And it’s not a lot more complicated than that. ”***

New Zealand Prime Minister, John Key

***“ The OECD has estimated the potential contribution of the Bioeconomy to New Zealand’s GDP at up to NZ\$182 billion (US\$124 billion) in 2030. ”***

OECD International Futures Programme The Bioeconomy to 2030:  
Designing a Policy Agenda (2009)

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## 2 Minister's Foreword



Hon Dr Wayne Mapp,  
*Minister of Research Science  
and Technology*

The biotechnology sector is a major contributor to New Zealand's economy. As this report notes, between 2004 and 2007, the sector achieved export revenue growth of 35% per annum. This is the sort of performance that we need to close the gap with Australia and raise our standard of living.

The Government is committed to economic growth. As part of this commitment, we are reviewing the Research, Science and Technology system to ensure that we get the most effective results for our public dollars. We are focussing on simplifying the system and how best we can increase business interest and investment in research. This will mean prioritising limited resources in areas we can get the most benefit.

This report is well timed. It clearly states the biotechnology sector's position. Industries that speak with a united voice and agree on common goals make it much easier for Government to understand their needs and ambitions.

New Zealand's long-term strength in bio-based industries provides a platform for sustained growth. This is a globally competitive sector. Over the last decade, the biotechnology industry has increased our capacity to innovate in pharmaceuticals, agri-technologies and bio-energy. We need to make sure that policy supports sectors with high-growth potential.

The recommendations from this Summit will feed into the Review work. I look forward to working with NZBIO to further enhance the contribution that research can make to New Zealand's future.

Hon Dr Wayne Mapp

*Minister of Research Science and Technology*



### 3 Introduction

In April 2009, the OECD International Futures Programme released the report “The Bioeconomy to 2030: Designing a Policy Agenda”.<sup>1</sup> The release of this report was timely for New Zealand, which is facing challenges to its future economic success due to declining labour productivity and decreasing levels of income parity with other OECD nations.

**The OECD has estimated the potential contribution of the Bioeconomy to New Zealand’s GDP at up to NZ\$182 billion (US\$124 billion) in 2030.**<sup>2</sup>



Bronwyn Dilley, Chief Executive, NZBIO

New Zealand is known internationally for the quality of its primary production sector. What is less well recognised is the significance of the scientific advances in biotechnology which underpin the sector’s international leadership, and the world class niche capabilities New Zealand has in the application of biotechnology to human health and industrial applications.

**Currently more than 70% of New Zealand’s export earnings are derived from biology-based industries spanning human and animal health, agriculture, horticulture and other natural products. Exports include finished products and ingredients destined for the food, cosmetics, nutraceutical and pharmaceutical industries.**<sup>3</sup>

Between 2004 and 2007 New Zealand’s biotechnology sector has demonstrated:<sup>4</sup>

- 33% increase in the number of biotechnology organisations
- 78% increase in biotechnology employees
- 23% *per annum* income growth
- 35% *per annum* increase in export revenue.

In addition, a recent report commissioned by New Zealand Trade and Enterprise showed:

- For every \$1 million direct output (spending) in the industry, a further \$1.03 million in gross economic output is created throughout the economy, resulting in a total output of \$2.03 million
- For each \$1 million of direct GDP that flows through the economy, a further \$950,000 GDP is generated, resulting in a GDP multiplier of the industry of 1.95
- For every one full-time equivalent job in biotechnology, a further 2.41 jobs are created in the broader economy, resulting in an employment multiplier for the industry of 3.41.

**“ For every one full-time equivalent job in biotechnology, a further 2.41 jobs are created in the broader economy, resulting in an employment multiplier for the industry of 3.41. ”**

This foundation uniquely positions New Zealand to develop a sophisticated bioeconomy spanning primary production, health and industry and creating high value-add products and services, through innovation, in areas such as food, forage, animal breeding and health, nutraceuticals, human therapeutics, medical devices and diagnostics, bioenergy and biomaterials.

<sup>1</sup> OECD International Futures Programme *The Bioeconomy to 2030: Designing a Policy Agenda* April 2009

<sup>2</sup> OECD International Futures Programme *The Bioeconomy to 2030: Designing a Policy Agenda* (2009) pg 200

<sup>3</sup> Natural Products New Zealand <http://www.naturalproductsnz.org/about.htm>

<sup>4</sup> 2008 NZ Biotechnology Industry Growth Report, section 5 Sector Growth & Development

<sup>5</sup> OECD International Futures Programme Scoping Document, *The Bioeconomy to 2030: Designing a Policy Agenda* pg 4

In fact the OECD suggests that if New Zealand fails to support the development of its bioeconomy that it will compromise its long term economic growth, stating *“Innovation in the biosciences requires active support from Government and industry. Those countries able to muster resources to invest in R&D and human capital formation – and equipped with policies to meet the challenges posed by new products and processes – will move ahead, creating wealth within their societies and becoming leaders in innovation globally. Those who fail to keep pace with these changes risk losing new global markets and compromising growth at the national level.”*<sup>5</sup>

Such an unequivocal statement from the OECD, at a time when New Zealand is facing some of its most difficult economic challenges, resonates strongly with New Zealand’s existing bio-based organisations.

NZBIO, as the national industry organisation representing bio-based industries in New Zealand, brought key members of the local bio community together to define a plan for action, fuelled by the belief that we should build on our natural competitive advantage in the biosciences, harnessing the strengths of our research and development capability, our leadership in primary production and niche areas of health and industrial applications, and utilising other supporting technologies in ICT, nanotechnology, engineering and high-tech manufacturing.

The Bioeconomy Industry Summit was convened over two days, held four weeks apart. Comprised of industry leaders drawn from private and public sector organisations, from across the spectrum of the bioeconomy and spanning the research, development and commercialisation pathway, the group set about assessing New Zealand’s progress in the sector over the past seven years, identifying challenges to further development and recommending steps that could be taken to create the optimal environment for maximum value creation and capture from the sector in the future.

Key objectives identified by the New Zealand Government include industry growth, enterprise creation, and transformation of existing firms for greater economic contribution through:

- Greater internationalisation – overcoming the barriers created by distance and increasing investment, technology and skill flows into New Zealand.
- Increasing innovation – recognising that investing in bio-based innovation not only creates new bio-business but also creates wider benefits for the economy.
- Thicker capital markets – developing the size and sophistication of New Zealand’s capital markets and attracting overseas investment.
- Leveraging off areas of existing or emerging growth potential – focusing on areas offering the greatest potential for growth and wider benefits for New Zealand.

Given the significance of research, science and technology to bio-based industries, the recommendations outlined in this report also support the current RS&T objectives of the Government in:

- Improved business support programmes;
- Developing areas of competitive strength;
- Bringing an economic development perspective to major government decisions;
- Reducing transaction costs;
- Setting government science priorities; and
- Improving business performance through R&D.

The recommendations developed by the Summit focus on key actions that could be undertaken to develop a stronger and more vibrant bioeconomy in New Zealand and are categorised under the following key areas:

1. A focused approach to maximise value capture from areas of competitive strength;
2. Access to capital for R&D and commercialisation;
3. Intellectual capital, knowledge, skills, expertise and experience in both science and management;
4. Legal, tax and regulatory systems;
5. Internationalisation; and
6. Improving Commercialisation Outcomes.

*“ The enduring competitive advantages in a global economy lie increasingly in three things – knowledge, relationships and motivation that distant rivals cannot match. ”*

Adoption of the recommendations put forward will enable New Zealand to face global challenges with a suite of technologies and organisations that will generate:

- Increased labour and resource productivity;
- High value-add, innovative export products;
- Increased intellectual capital and skills within New Zealand;
- Niche opportunities in novel technologies for health and industrial/environmental applications; and
- Increased Gross Domestic Product.

I would like to thank the Summit participants, the Board of NZBIO, Summit facilitator Dr Peter Riddles, New Zealand Trade & Enterprise, the Ministry of Research Science & Technology and the Ministry of Economic Development for their support, without whom the 2009 Bioeconomy Industry Summit would not have been possible. Mostly I would like to thank the New Zealand bioscience community for their dedication and their commitment to scientific and commercial excellence and international leadership.

Michael Porter (1998) wrote *“The enduring competitive advantages in a global economy lie increasingly in three things – knowledge, relationships and motivation that distant rivals cannot match”*.<sup>6</sup> These three things have been demonstrated repeatedly by New Zealand’s bioscience community and now is the time to provide the support that is necessary to allow them to play their role in securing New Zealand’s economic future.



Bronwyn Dilley

Chief Executive, NZBIO



## 4 The Importance of a Robust Bioeconomy for New Zealand

*"The OECD Project supposes the bioeconomy to be the aggregate set of economic operations in a society that use the latent value incumbent in biological products and processes to capture new growth and welfare benefits for citizens and nations. These benefits are manifest in product markets through productivity*

*" The bioeconomy is made possible by the recent and continuing surge in the scientific knowledge and technical competences that can be directed to harness biological processes for practical applications. "*

*gains (primary production, health), enhancement effects (health, nutrition) and substitution effects (environmental and industrial uses as well as energy); additional benefits derive from more eco-efficient and sustainable use of natural resources to provide goods and services to an ever growing global population.*

*The bioeconomy is made possible by the recent and continuing surge in the scientific knowledge and technical competences that can be directed to harness biological processes for practical applications."*

On the international stage New Zealand is recognised as a leader in primary production. In fact, for the past 150 years, the excellence of the primary production sector has ensured New Zealand's place in the top 25 OECD nations in the world. However, even with scientific and technical leadership underpinning constant growth and improving competitiveness in its agricultural sector, New Zealand's international economic ratings have declined.<sup>8</sup> In addition, the 2008 global financial crisis has changed the international landscape, limiting the ability of Governments to undertake major investments to drive the creation and development of new industries.

In 2009, the New Zealand Government stated that its key objectives are to raise exports from 30% to 40% GDP and to achieve income parity with Australia by 2025. In order to achieve these objectives, it is widely recognised that more than "business as usual" is required. Within a fiscally constrained environment, New Zealand needs to focus on areas of competitive advantage that have the potential to underpin new industries and the formation of new enterprises, increasing labour productivity and improving export performance, whilst ensuring diversification of the economic base to ensure a stronger and more robust economy in the future.

The scientific advances in biotechnology which underpin New Zealand's international leadership in primary production, and the world class niche capabilities New Zealand has in the application of biotechnology to human health and industrial applications, offer a suite of opportunities for economic diversification and uniquely positions New Zealand to develop a sophisticated bioeconomy spanning primary production, health and industry and creating high value-add products and services, through innovation, in areas such as food, forage, animal breeding and health, nutraceuticals, human therapeutics, medical devices and diagnostics, bioenergy and biomaterials.<sup>10</sup>

"Biotechnology offers technological solutions for many of the health and resource-based problems facing the world. The application of biotechnology to primary production, health and industry could result in an emerging "bioeconomy" where biotechnology contributes to a significant share of economic output."<sup>11</sup>

**The OECD has estimated the potential contribution of the Bioeconomy to New Zealand's GDP at up to NZ\$182 billion (US\$124 billion) in 2030.<sup>9</sup>**

<sup>7</sup> OECD International Futures Programme Scoping Document, *The Bioeconomy to 2030: Designing a Policy Agenda* pg 3

<sup>8</sup> NZBIO Position Paper, November 2008 pg 3

<sup>9</sup> OECD International Futures Programme *The Bioeconomy to 2030: Designing a Policy Agenda* (2009) pg 200

<sup>10</sup> OECD 2007 Review of NZ Innovation System Executive Summary

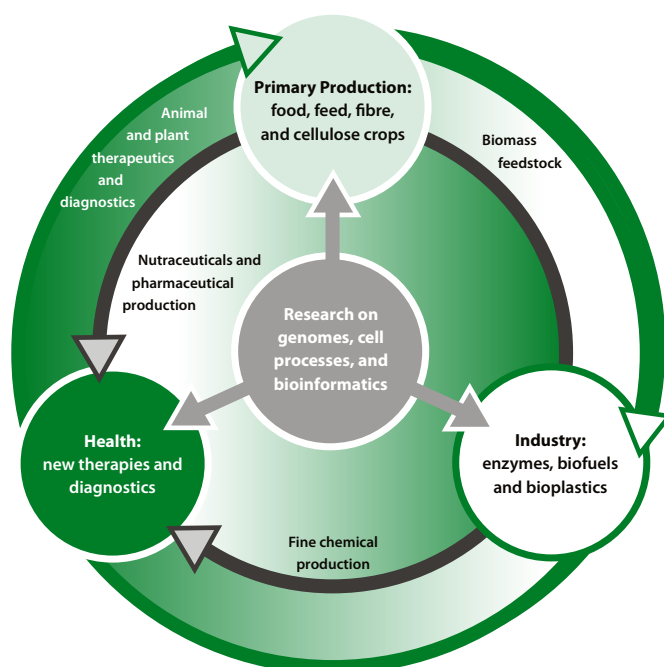
<sup>11</sup> OECD International Futures Programme *The Bioeconomy to 2030: Designing a Policy Agenda* (2009) pg 19

## What is a bioeconomy?

A bioeconomy involves three elements:

1. Biotechnological knowledge:
  - Biotechnological innovation in developing new processes for producing products including biopharmaceuticals, recombinant vaccines, new plant and animal varieties, industrial enzymes etc.
  - Requires intensive R & D & innovation.
2. Use of renewable biomass & efficient bioprocesses to achieve sustainable production:
  - Renewable biomass is obtained from primary sources – food crops, grasses, trees, marine algae, and from household, industrial and agricultural waste.
  - Bioprocesses can then be used to create a range of products including paper, biofuels, novel biomaterials, plastics and industrial chemicals.
3. Integration between knowledge and applications:<sup>12</sup>
  - There are three main fields of application of biotechnology:<sup>13</sup>
    - i. Primary production (all living natural resources – forests, plant crops, livestock, insects, fish & other marine resources);
    - ii. Health (pharmaceuticals, diagnostics, nutraceuticals, medical devices); and
    - iii. Industrial (enzymes, chemicals, plastics, mining, pulp and paper, biofuels and environmental applications e.g. bioremediation).

**Figure 1.1 Current and expected integration across biotechnology applications**



Biotechnology has in the past been viewed as a sector in its own right. However, the bioeconomy concept and the integration now occurring across applications shows that biotechnology is actually an enabling technology which delivers transformation across many sectors and enables value maximisation and capture through convergence between sectors. Health applications will enable productivity gains

<sup>12</sup> OECD International Futures Programme *The Bioeconomy to 2030: Designing a Policy Agenda* (2009) pg 22

<sup>13</sup> OECD International Futures Programme *The Bioeconomy to 2030: Designing a Policy Agenda* (2009) pg 27

in the primary sector through animal and plant therapeutics and diagnostics. Primary production applications will enable health outcomes through pharmaceutical production and nutraceuticals; and industrial applications through biomass for biofuels and biomaterials. Industrial applications will enable health outcomes through manufacture of fine chemicals.

For New Zealand, our great depth of experience in biotechnology as applied to primary production, and internationally recognised niche areas of excellence in health and industrial biotechnology, create a foundation upon which a robust, vibrant and highly productive bioeconomy can be developed. The OECD identifies that integration across research applications and value-added chains can lead to greater efficiency and economies of scale in the commercial use of biotechnology.<sup>14</sup>

***In the mid-2000's biotechnology is estimated to have delivered less than 1% of GDP in OECD countries. In 2004 primary production, health and industrial sectors that either used biomass or with current or potential applications for biotechnology accounted for 5.6% GDP of the EU and 5.8% GDP of the US. Economic potential of biotechnology can be increased through economies of scale & scope to increase the efficiency of research & applications.***<sup>15</sup>

It is estimated that by 2015 approximately 50% of global production of food, feed and industrial feedstock will be derived from plant varieties developed through the application of biotechnology (including GM, intragenics, gene shuffling & marker assisted selection). Biotechnologies will be developed to improve dairy & meat products, with GM being increasingly used to develop animal varieties that can produce pharmaceuticals or other valuable compounds in milk. Biotechnological applications will be used to develop almost all therapies for health, with no distinction being made between the pharmaceutical sector and the health biotechnology sector. The value of biochemicals could increase to between 12 – 20% of all chemical production (from 1.8%) by 2015. Biofuel production is likely to shift from starch based bioethanol to higher energy density fuels.<sup>16</sup>

10

Importantly, biotechnology holds the key to many of the issues facing the global population through:

- Improved supply and environmental sustainability of food, feed and fibre production;
- Improved water quality;
- Access to renewable energy and maintenance of environmental sustainability;
- Improved health of people and animals; and
- Maintenance of biodiversity through detection of invasive species.

This represents a unique opportunity for New Zealand through:

1. Increased labour and resource productivity;
2. High value-add, innovative export products;
3. Increased intellectual capital and skills within New Zealand;
4. Niche opportunities in novel technologies for health and industrial/environmental applications; and
5. Increased GDP.

Ironically, many of the technologies that attract negative public reaction and are seen to be in conflict with New Zealand's "100% Pure", clean, green image, are actually the technologies that hold the solution to long term environmental sustainability and future economic prosperity. A broader campaign of public education and evidence-based information dissemination should be considered along with the specific recommendations of this report.

<sup>14</sup> OECD International Futures Programme *The Bioeconomy to 2030: Designing a Policy Agenda* (2009) pg 24

<sup>15</sup> OECD International Futures Programme *The Bioeconomy to 2030: Designing a Policy Agenda* (2009) pg 23

<sup>16</sup> OECD International Futures Programme *The Bioeconomy to 2030: Designing a Policy Agenda* (2009) pg 99



## 5 Global Drivers of the Bioeconomy

The world is currently facing unprecedented challenges: water shortages, population growth, redistribution of population and labour, finite natural resources, increasing dependence on fossil fuels, an ageing population, greater expectations of healthcare and health systems and climate change.<sup>17</sup> Meanwhile, the development of new technologies, not only in biotechnology, but in ICT, engineering and nanotechnology, and the integration of these, offers solutions.

**The key factor is in understanding that the solutions lie in harnessing technological innovation to create new resources and improve efficiency of use of existing resources.**

- Population & incomes:
  - 97% of population growth will occur in developing countries with China & India alone comprising approximately a third of global population in 2030;
  - World GDP per capita will increase 57% to USD 8,600 with growth occurring primarily in non-OECD countries;
  - Increasing globalisation, with the economic futures of OECD countries being focused on services and innovation, requiring significant capital for R&D and commercialisation and access to large markets in developing countries being a key driver of growth;
  - Major biotechnology capabilities and industries will continue to grow in developing countries; and
  - Increased demand for food and healthcare driven by increased incomes in developing nations and the ageing of the global population.
- Demographics & Education:
  - By 2030 90% of the global workforce will be in developing countries (40% in China & India);
  - Educational qualifications of the global workforce will improve by 2030: In OECD countries those with a tertiary qualification will represent 36% (up from 26%); In non-OECD countries the component of their workforces with tertiary education will double (China 5% to 10%; Brazil & India 6.5% to 14%); and
  - Decreased importance of geographic remoteness through increased connectivity.
- Energy consumption:
  - Without significant policy change to affect energy use and climate change the world will be more reliant on fossil fuels in 2030;
  - Demand for oil, gas & coal will increase by over 44% with the proportion of energy demand met by fossil fuels remaining steady at 80%;
  - GHG emissions are expected to continue to increase, adding to increased temperatures from climate change and subsequent negative impacts on ecosystems and human activities; and
  - Climate change will have pronounced impacts on agricultural, environmental and industrial biotechnologies with a need to develop technologies in these areas which mitigate the effects of climate change.

***“ Climate change will have pronounced impacts on agricultural, environmental and industrial biotechnologies with a need to develop technologies in these areas which mitigate the effects of climate change. ”***

<sup>17</sup> OECD International Futures Programme *The Bioeconomy to 2030: Designing a Policy Agenda* (2009) Chapter 2 pg 31

- Availability & cost of key resources (energy, food, water):
  - Growing demand will see the average price of food, feed and energy commodities from 2008-2017 at a significantly higher level than in the last decade;
  - Supply-side solutions (such as increasing the volume of land under cultivation) will offset some demand but not all;
  - Developing countries should surpass the OECD countries in the production of most food commodities by 2017;
  - Increased demand for agricultural products will put further pressure on water use (currently 70% of water is withdrawn for agricultural purposes);
  - By 2030 the population living in areas of high & medium water stress will increase by 38% & 72% respectively; and
  - Agricultural biotechnologies, specifically those that increase yield & tolerance to stress, will form a possible solution.
- Access to healthcare:
  - Healthcare costs could increase from an average of 5.7% of GDP in OECD countries to 12.8% by 2030;
  - Potential controls on prices and access to new health technologies are the most important strategic risks facing health biotechnology companies; and
  - Downward pressure on health technology revenue decreases incentives to innovation, except where new technologies can decrease costs e.g. application of agricultural biotechnology to produce pharmaceuticals in plants could decrease production costs by up to two thirds; Functional foods & nutraceuticals can decrease healthcare costs through disease prevention.
- Supporting & competing technologies:
  - Progress will continue in enabling & competing technologies including bioinformatics and alternative energy sources;
  - Supporting technologies (computing & nanotechnology) will influence development of biotechnology products; and
  - The optimal technological solution will depend on how the social, environmental and economic benefits of biotechnology are viewed in comparison with alternatives in market economies.

***The bioeconomy in 2030 will depend on the ability of governments and firms to develop and apply biotechnology to address these challenges and capitalise on opportunities.***

Data on the contribution of the bioeconomy to New Zealand's GDP are not available. However, the OECD predicts that globally 2.7% of GDP will be attributable to the bioeconomy, with primary production making the greatest contribution.<sup>18</sup> New Zealand's economy is dominated by the primary production sector and, therefore, New Zealand may have significantly more than the global average of 2.7% GDP to be gained through a robust, integrated bioeconomy.

<sup>18</sup> OECD International Futures Programme *The Bioeconomy to 2030: Designing a Policy Agenda* (2009) pg 193



## 6 New Zealand's Bioeconomy in 2009

The concept of an integrated bioeconomy is a relatively new one, with prominence of the idea really only gaining traction with the release of the OECD International Futures Programme Report "The Bioeconomy to 2030: Designing a Policy Agenda" in April 2009. In New Zealand, Biotechnology was identified as a sector of interest under the Growth & Innovation Framework in 2002, and has been measured since by the Statistics New Zealand biennial Biotechnology Survey. The data from this survey has been published in the 2006 and 2008 Biotechnology Industry Growth Reports,<sup>19</sup> however it is important to note that the data collected is from organisations who have self-selected themselves as biotechnology organisations.

In addition, internationally, such surveys have shown to be extremely sensitive to the public perception of the sector at any particular time. This has resulted in a data set which is likely to have not captured the extent of the application of biotechnology across the breadth of the New Zealand bioeconomy. However; the data below shows significant growth trends in those companies that have participated over the past five to seven years.

Between 2004 and 2007 New Zealand's biotechnology sector has demonstrated:<sup>20</sup>

- 33% increase in the number of biotechnology organisations;
- 78% increase in biotechnology employees;
- 23% *per annum* income growth; and
- 35% *per annum* increase in export revenue.

In addition, a recent report commissioned by New Zealand Trade & Enterprise<sup>21</sup> assessed economic multipliers for New Zealand's biotechnology sector, in an attempt to assess the impact of the biotechnology industry on the broader economy. Given the issues relating to data on the broader application of biotechnology, the results of this report are somewhat conservative, however they are internationally comparable. The report found that:

- For every \$1 million direct output (spending) in the industry, a further \$1.03 million in gross economic output is created throughout the economy, resulting in a total output of \$2.03 million;
- For each \$1 million of direct GDP that flows through the economy, a further \$950,000 GDP is generated, resulting in a GDP multiplier of the industry of 1.95; and
- For every one full-time equivalent job in biotechnology, a further 2.41 jobs are created in the broader economy, resulting in an employment multiplier for the industry of 3.41.

Implementation of the recommendations of the 2003 Biotechnology Taskforce Report<sup>22</sup> has contributed to the growth of the sector, however a new approach is needed to ensure that New Zealand can capitalise on the opportunities offered by the bioeconomy. The OECD has estimated that the potential contribution of the Bioeconomy to New Zealand's GDP as at least NZ\$182 billion (US\$124 billion) in 2030.<sup>23</sup>

***" For every \$1 million direct output (spending) in the industry, a further \$1.03 million in gross economic output is created throughout the economy, resulting in a total output of \$2.03 million. "***

<sup>19</sup> 2006 & 2008 NZ Biotechnology Industry Growth Reports, published by NZBIO with support from MoRST, NZTE & LEK Consulting.

<sup>20</sup> 2008 NZ Biotechnology Industry Growth Report, section 5 Sector Growth & Development

<sup>21</sup> BERL 2009 Multipliers for the Biotech and Biotech-active Industry in New Zealand

<sup>22</sup> 2003 New Zealand Biotechnology Taskforce Report

<sup>23</sup> OECD International Futures Programme *The Bioeconomy to 2030: Designing a Policy Agenda* (2009) pg 200

The challenges faced by New Zealand have been well documented and those facing the bioeconomy are largely the same, however the Summit identified the following challenges:

- Geographic remoteness from traditional major markets;
- Shallow domestic capital markets;
- Limited pool of internationally experienced science & business talent;
- Lack of a competitive environment in areas of regulatory, legal and tax regimes;
- Cultural resistance to change and adoption of novel technologies; and
- A need for cohesive and focused economic strategy, underpinned by a sense of urgency.

However; there are a number of key strengths and opportunities which can be capitalised upon to facilitate the development of the bioeconomy in New Zealand, in addition to the global drivers that have already been identified. These include:

- Low cost, world class research & development capabilities;
- Critical mass of R&D focused on the application of biotechnology to primary production and niche areas of health and industry;
- Excellent biosecurity and biodiversity;
- Strong regulatory environments, especially pertaining to food safety;
- Opportunity to attract significant amounts of foreign direct investment into early stage ventures, supporting firm creations, increased intellectual capital and development of a new generation of export products; and
- Geographic proximity to Australia and large emerging markets in Asia.

The Summit's recommendations centre around six key areas:

1. A focused approach to maximise value capture from areas of competitive strength;
2. Access to capital for R&D and commercialisation;
3. Intellectual capital, knowledge, skills, expertise and experience in both science and management;
4. Legal, tax and regulatory systems;
5. Internationalisation; and
6. Improving Commercialisation Outcomes.

The Bioeconomy Industry Summit has explored each of these areas, recognising the outcomes that have already been achieved, identifying areas for improvement and recommending actions that would assist New Zealand to maximise the economic, environmental and social benefits of a robust bioeconomy.



## 7 A Focused Approach

As a small economy, New Zealand faces constraints on the amount of public support that can be provided to support emerging industries. This means that focus on areas where there is existing capability and competitive advantage is essential (priorities), as is an understanding of a balanced approach to both basic research and industry-facing commercially focused research.

The current review of the RS&T system has indicated that these broader issues are understood by the New Zealand Government; however the implementation of the actual policies and frameworks will have significant impact on the ability of the bioscience community to contribute to economic growth.

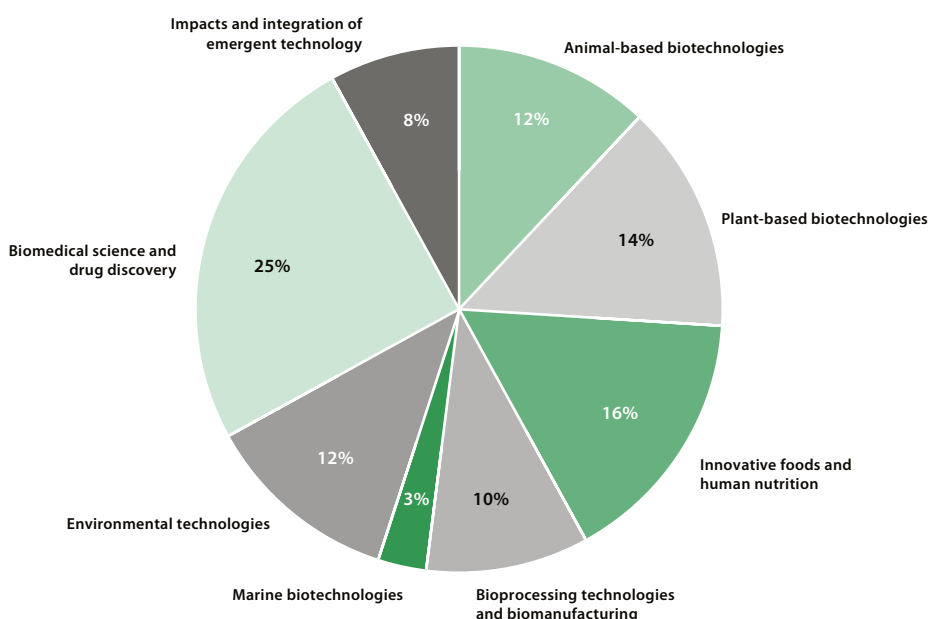
*“ Rapidly developing capabilities in developing countries (e.g. China) mean that New Zealand must clearly identify and exploit areas of technical leadership. ”*

In setting RS&T priorities there are many factors that need to be considered in order for the resulting system to ensure maximum value is captured from the public investment in RS&T and that the environment is conducive to industry engagement and private investment.

### Key issues identified by the Summit include

- The bioscience industry, and most industries based on emerging technology, are driven by the creation of novel, valuable intellectual property and the protection of that IP.
- Application of biotechnology to primary production, health and industry offers multiple benefits through building on existing international competitive strength and significant economic impact as well as addressing needs relating to climate change and sustainable use of resources, allowing significantly increased productivity from the same resource base. Rapidly developing capabilities in developing countries (e.g. China) mean that New Zealand must clearly identify and exploit areas of technical leadership.

**Area of Biotechnology Application 2007**



- New Zealand’s natural resources are limited and therefore unlikely to meet global scale production and export volumes to satisfy future demands for food and biofuel. Therefore a focus on smaller volume, high value products and managed production overseas based on New Zealand IP is required.

- There needs to be a balance of focus between existing capability and emerging industries. Both are required in order to achieve the required transformation in the economy.
- Global drivers -population growth, greater demand for food, health, energy, growing wealth, increasing demand for high protein foods, the ageing population with greater healthcare needs, education and utilising waste streams- must be considered in the New Zealand context as the policies implemented now will impact on the country's ability to respond in the future.

#### *Progress to Date*

- New Zealand has developed an internationally recognized capability in agricultural biotechnology, and niche areas of excellence in health and industrial biotechnology.
- New Zealand's core biotechnology organizations already span a broad-based bioeconomy.
- The Minister of Research, Science and Technology has signalled the intention to develop a set of national science and innovation priorities that encompass basic research and "firm-facing" RS&T initiatives.
- The Government has appointed the Chief Scientific Advisor to the Prime Minister, providing a high level science advisory resource and an international representative of New Zealand's science excellence.

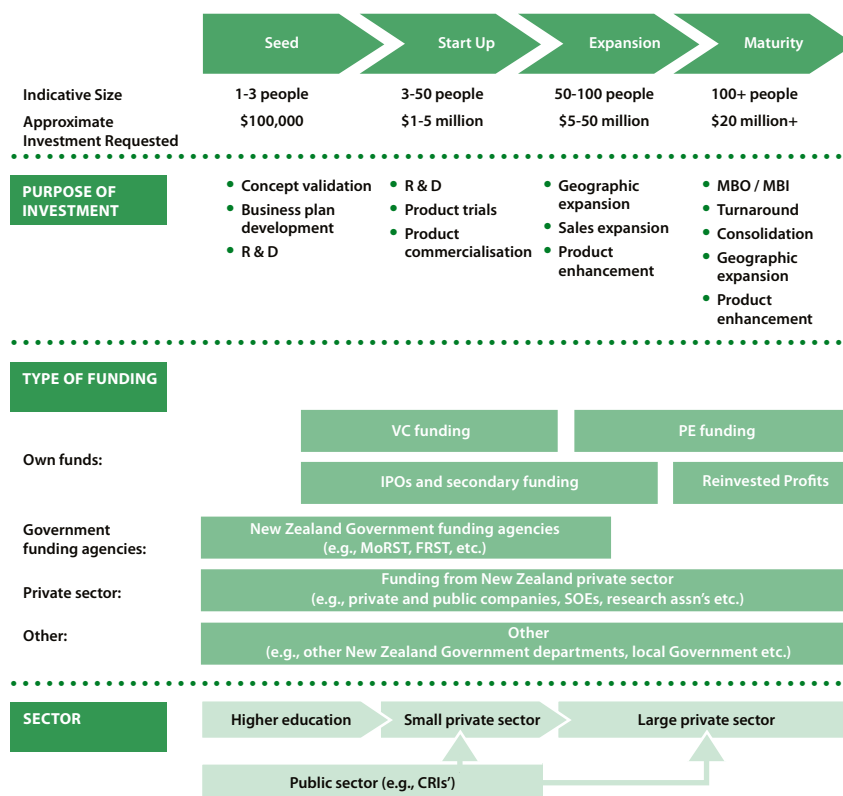
#### *Recommendations*

1. The Government focuses on the bioeconomy as a key driver for economic growth.
2. Strategies and priorities build on areas of strength (primary production – including food, forage, animal health, agriculture & aquaculture applications; niche areas of human health & industrial biotechnology) whilst supporting emerging capabilities in areas of convergence (functional foods, biofuels, nutraceuticals, fine chemical production, niche manufacturing).
3. Measurement in the growth of the subsectors identified should be recorded using metrics of research & development expenditure (or funding); capital value; and export value.
4. The bioscience community is consulted as a set of critical stakeholders of New Zealand's science and innovation strategy.
5. Government investment in RS&T is streamlined to improve access to and understanding of available schemes, whilst ensuring novel, commercially focused science is not excluded through area of application eligibility requirements.
6. Key Performance Indicators and Investment priorities are designed to ensure a balanced view on basic research and commercially focused research, with a focus on rewarding innovation and productivity.
7. Creation of a cross-Ministry bioeconomy policy working group (a coordinated MoRST, MAF, MFAT, MED, FRST, NZTE, MoE group) to work proactively with industry and ensure supportive policy frameworks for the development of the bioeconomy.



## 8 Access to Capital

The ability of New Zealand’s bioeconomy to contribute to economic growth depends on its ability to raise funds from a variety of sources and to complete value-creating deals. Financing in the sector generally occurs in a staged manner that reflects the investment risk at each stage, as outlined below.<sup>24</sup>



Currently, 85% of core biotechnology companies expenditure comes from “own funds”. “Own funds” includes external funding received from both public and private investment markets, and includes Venture Capital funds (VC), Private Equity funds (PE) Initial Public Offerings (IPOs) and secondary offerings (either public or private). These funds are generally made available based on commercial terms either as debt or equity. In addition, investment of own funds includes invested operating income. Currently only approximately 10% of core biotechnology company expenditure is sourced from Government investment. Given the ongoing growth of the sector, this highlights the significant return on investment on public funds from core biotechnology organisations.

### Key issues identified by the Summit include

- The capital markets of New Zealand are shallow and do not currently adequately provide for an exit for pre-seed and seed investors.
- Bioscience based companies need to raise significant amounts of patient capital to undertake the relatively long commercialisation timeframe.
- There is a need for investors that understand the relatively complex risk profile of bioscience investments.
- There is a lack of incentives for capital contribution from the domestic and international private sector into New Zealand.

<sup>24</sup> 2008 NZ Biotechnology Industry Growth Report, section 6 Financing & Deals

- Investment by big corporations, especially “big pharma” has diminished significantly due to decisions in other portfolios which have triggered negative reactions to the New Zealand market and resulted in significant losses in contract research opportunities.

### *Progress to Date*

- Establishment of a number of funds which have supported development & commercialisation in the bioscience industries:
  - \$4.8m Pre-Seed Accelerator Fund established in 2003 to support proof of concept studies (administered by FRST).
  - New Zealand Venture Investment Fund with \$200 million of funds under management, invested through two vehicles: the \$160 million Venture Capital Fund of Funds, the \$40 million Seed Co-investment Fund. This is a public-private partnership to span investment in development & commercialisation.
  - Establishment of Australia New Zealand Biotechnology Partnership Fund in 2004 (now \$5m annually until 2012).
  - International Investment Opportunities fund established in 2004 (\$2.88m).
  - BioPacificVentures established.
- \$2.35m over 4 years through MoRST led Best Practice for Commercialising Biotechnology Research programme, aimed at strengthening research-industry interface, stimulating flow of research being commercialised & increasing commercialisation skills.
- Regulatory, Policy & Tax changes that have supported an improved environment for investment include:
  - Overseas investment rules simplified July 2009.
  - 2004 Taxation (Venture Capital & Miscellaneous Provisions) Act 2004 removed barriers to unlisted companies accessing offshore VC investment.
  - The Taxation (Base Maintenance & Miscellaneous Provisions) Bill better aligned the depreciation treatment of patents with patent life as of 05/06.
  - Assignment of ownership of publicly-funded IP to CRI’s, freedom for CRI’s to use the most effective commercialisation route and support for commercialisation undertaken with private-sector partners rather than alone.
  - Clinical Trials Infrastructure Support Programme (NZTE).
  - In 2003 FRST agreed to extend support to NZ-based clinical trials to FDA Phase II or equivalent for veterinary, nutraceutical and health products.

### *Recommendations*

1. Continue to actively develop the broader environment to be conducive to private investment (foreign & domestic).
2. Adopt recommendations of the Capital Markets Taskforce with respect to deepening the capital pool in New Zealand.
3. Continue to support industry partnerships but provide better coordination between FRST and MED and reduced co-investment requirements.

4. Encourage and incentivise increased investment in bio-based enterprises:
  - a. From Angel investors through effective, national, coordinated networks and attraction of international Angel investors to New Zealand;
  - b. From NZVIF, ACC and Superannuation funds;
  - c. Through creating new specialty funds to focus on bio-based enterprises, potentially including foreign investors;
  - d. Identifying and removing disincentives to foreign direct investment in the bioeconomy and actively supporting the attraction of such investment; and
  - e. Explore share market vehicles or alternative investment structures to make it easier for individuals and small investors to invest in biotechnology based companies without the companies having to face the high compliance and establishment costs of being a listed entity.
5. Accessing & incentivising Foreign Direct Investment into New Zealand's Bioeconomy:
  - a. Define geographic priorities for focused incentives to attract investment;
  - b. Incentivise overseas investment into New Zealand's bioeconomy, such as tax rebates or grants for targeted overseas industries and geographies;
  - c. Attraction of large industry partners (such as big pharmaceutical companies) into New Zealand to build investment in R&D and therefore create capability and improved commercialisation pathways; and
  - d. Expand the size and geography of the Biotechnology Partnership Programme.



## 9 Knowledge, Skills & Expertise: Building Intellectual Capital

In order to build industries and organisations based on cutting-edge research and development, New Zealand must focus on developing an intellectual capital base of highly educated New Zealanders and on attracting leading talent from offshore. To truly capture the value of a bioeconomy, New Zealand needs not only bioscientists, but those qualified in supporting technologies, such as engineering, nanotechnology and ICT.

### *Key Issues Identified by the Summit Include*

- New Zealand needs a critical mass of both technical and management talent that can be drawn on by inventors, entrepreneurs, investors and government, to provide the required knowledge skills and experience to support the bioeconomy and the supporting ecosystem.
- A key factor is the attraction and retention of second generation talent, those that have taken an enterprise through start-up and growth before, and who then remain in New Zealand to work with a second enterprise, becoming a key contributor to a series of ventures, gaining invaluable experience along the way.<sup>25</sup>
- The creation of jobs in the bioeconomy, results in the creation of jobs in other sectors. As per Porter's (1998) assessment that that productivity of a cluster not only contributes to the productivity of the nation, but also to the productivity of other clusters, the creation of high value jobs in the bioeconomy, results in the creation of additional high value jobs in other industries.
- A recent BERL Report on Economic Multipliers of the Biotechnology Industry in New Zealand found that for every one full-time equivalent job in biotechnology, a further 2.41 jobs are created in the broader economy, resulting in an employment multiplier for the industry of 3.41.
- With China & India rapidly developing highly skilled workforces, often comprised of returning students from Western universities, and putting in place aggressive policies to secure this returning talent, in addition to securing international talent, New Zealand needs to act now to ensure a pipeline of talent to create the required intellectual capital in its talent pool to underpin the Government's desired improvements in productivity and GDP.

### *Progress to Date*

- The Biotech Experts Network established as part of World Class New Zealand Programme.
- Development of KEA (Kiwi Expatriates Abroad) Programme to foster linkages between leading New Zealanders working off-shore and New Zealand.
- Development of Masters of Bioscience Enterprise programme At University of Auckland.
- Establishment of and sectoral expertise provided through NZTE Beachheads Programme.
- Increase in the number of postgraduate degrees awarded in biological science and health, from 500 in 1999 to 700 each year between 2004-2006.<sup>26</sup>
- Establishment of MoRST NZ Science Counsellors in Europe & US to promote closer links.
- Science Learning Hub (incorporating Biotechnology Learning Hub) established, working to actively promote the benefits of science and biotechnology at a high school level.
- Promotion of New Zealand Universities off-shore to attract high calibre international students.

<sup>25</sup> Making Biotechnology Work for New Zealand, Mark J Ahn et al, Grow Wellington, NZBIO, pg 15

<sup>26</sup> 2008 NZ Biotechnology Industry Growth Report

## Recommendations

1. Develop incentives for graduates, especially at PhD level, to stay in New Zealand after the completion of their studies. Incentives may include commercial internships, tax or fee relief in return for an agreed period working in New Zealand based enterprises.
2. Incentivise leading offshore New Zealanders to return to New Zealand to continue their work. The Australian Federation Fellowship programme successfully repatriated a number of international scientific leaders back to Australian organisations, resulting in opportunities for PhD and post-graduate scientists to work in world-class teams and creation of new enterprises from research. Other incentive programmes may include tax relief, fellowships or relocation support and should focus on both technical and business leaders.

*“ To truly capture the value of a bioeconomy, New Zealand needs not only bioscientists, but those qualified in supporting technologies, such as engineering, nanotechnology and ICT. ”*
3. Continue to develop a broader economic environment that results in minimal opportunity cost for New Zealanders wishing to return home, including taxation, housing, management of off-shore superannuation in a seamless manner and competitive employment conditions.
4. Set achievable objectives for population-wide levels of education across New Zealand in the future, and implementation of broader policy and programmes to facilitate the reaching of these objectives. For example, a UK definition of a knowledge intensive sector includes at least 25% of a sector’s workforce being qualified to a degree level and 30% of the workforce being employed in professional, managerial, scientific and technical occupations.<sup>27</sup>
5. Provide support for programmes which support cross-fertilisation of skill-sets and multi-disciplinary qualifications by ensuring that both business and science programmes are actively engaging with each other, highlighting the opportunities in business to science graduates, and the opportunities in science-based industries to management/business graduates.
6. Support organisations, such as NZBIO, to expand programmes to promote the immense career opportunities in the bioeconomy to high school and university students, from both a scientific career and business career perspective.

<sup>27</sup> Rod Oram, *We think therefore we earn*, Sunday Star Times, 23 August 2009



## 10 The Importance of Being International

As a geographically remote nation, New Zealand's ability to form meaningful connections to global partners and markets at an individual, enterprise and national level, remains a key element in success and economic growth.<sup>28</sup> This is even more critical in research-driven industries, where risks to development are greater, capital requirements are larger and markets rest primarily overseas.

### *Key issues identified by the Summit include*

- Globally, bioscience develops rapidly, with a changing landscape being a constant feature for most organisations in the bioeconomy. International linkages and information are essential in order for New Zealand organisations to respond to their changing markets & competitive landscapes. This rapidity of change needs to be understood, and systems implemented to ensure NZ organisations do not face any additional hurdles or delays in New Zealand that limit their ability to respond to an already variable environment.
- Recent movements towards significantly increased collaboration, closer relationships and decreased regulatory differences under the expansion of the Closer Economic Relations agreement with Australia represents a significant opportunity for New Zealand to work with its trans-Tasman neighbour to become a key gateway into the growing biotechnology hub of Asia. A key opportunity also exists to leverage shared infrastructure and increased collaboration into new enterprise formation.
- International linkages are important in:
  - Developing collaborations at the scientific and technical level;
  - Identifying potential partners for product development or distribution;
  - Accessing capital through Foreign Direct Investment;
  - Identifying assets for acquisition to strengthen market position for NZ companies;
  - Developing a NZ Inc brand offshore that attracts talent, capital and opportunities to New Zealand; and
  - Delivering high value products to large global markets of consumers.

### *Progress to date*

- NZ Inc delegations to key offshore bio-based conferences & international trade fairs including:
  - BIO, USA (first delegation 2002).
  - AusBiotech Annual Conference.
  - Medica.
  - BioPartnering Europe, Pacific Rim Summit, Agricultural Biotech International Conference and others.
- Ongoing development of the annual NZBIO conference into an Internationally recognised event with significantly increased quality and quantity of speakers and delegates.
- Leverage of Industry Association Networks by NZBIO to allow discounted access to events and conferences run by: AusBiotech, BiotechCanada, Singapore Bio, NZBIO, Korea, Japan, DuBiotech, Malaysia, Thailand and Taiwan.

<sup>28</sup> OECD Review of NZ Innovation Policy 2007 pg 63

- NZBIO is a key participant in BioNet Asia Pacific (BNAP) a collaboration between ten Asia Pacific bio-industry associations (listed above), providing for reciprocal member benefits and access to all members to an online portal of bioscience-based businesses throughout the member countries.
- The Australia New Zealand Biotechnology Partnership Fund (ANZBPF) funded by NZTE, established after the signing of the Australia New Zealand Biotechnology Alliance.
- Collaboration agreements pertaining to biotechnology with the State Governments of Victoria and Queensland.
- Collaboration and participation in the Australian Synchrotron Project, led by MoRST, providing access to the only significant synchrotron facility in the southern hemisphere.

### **Recommendations**

1. Continue to support an NZ Inc presence at key international conferences and tradeshow, working proactively with industry to provide support and tailored assistance programmes.
2. Provide support for companies exploring potential international markets through Export Market Development Assistance programmes.
3. Continue to support investment mechanisms which support international collaborations, preferably discretionary vehicles that can respond to both research and industry collaborations as they arise.
4. Continue to develop stronger trans-Tasman linkages, working actively with industry to identify opportunities for significant mutual gain for both nations.
5. Promote ANZ as a “gateway” to the Asia Pacific region for bioscience based industries.
6. Actively seek and utilise opportunities to build New Zealand’s reputation in bioscience based industries in Asia and the Middle East, in addition to geographies of traditional focus (EU & US). For example, running bioscience focused trade delegations to World Expo 2010 Shanghai and key events in Japan, Korea, Thailand, Taiwan, Singapore, Malaysia and Israel.
7. Support the ongoing collection of key statistics and the publication of collateral to support New Zealand’s growing capabilities in the bioeconomy to enable informed markets offshore.
8. Creation of a joint group incorporating Government and Industry tasked with coordinating international promotional activities to sell the benefits of New Zealand’s bioeconomy to overseas companies and investors.



## 11 Legal, Tax & Regulatory Frameworks

The OECD identifies that the value that countries will extract from the bioeconomy will depend on their regulatory preparedness for new technologies.<sup>29</sup> An effective regulatory environment provides significant competitive and comparative advantage in the development of innovation driven, bioscience based businesses. New Zealand's legal, regulatory and tax environment needs to be viewed as another opportunity to create an internationally competitive economy.

### *Key issues identified by the Summit include*

- New Zealand has a well developed regulatory environment that provides confidence in our export products and biosecurity.
- The key aspects of any regulatory, legal and tax regime are certainty and robustness, especially when fostering products and services based on scientific and technical excellence and innovation.
- There are significant gains to be made by constantly improving regulatory harmonisation with major trading partners in order to ensure that the broader landscape is competitive, to attract inward investment and to prevent transfer of technology and enterprises off-shore.
- Regulatory systems should be lean and effective, and not create barriers to innovation through costly application processes and long time delays.

### *Progress to Date*

- R&D Tax Credits established and widely recognised internationally as a strong incentive to undertake research and development in New Zealand. R&D Tax Credits scheme repealed in 2009.
- MoRST leadership in undertaking a review of the regulatory system as it pertains to biotechnology and an ongoing monitoring role played since 2003.

***“ There are significant gains to be made by constantly improving regulatory harmonisation with major trading partners in order to ensure that the broader landscape is competitive, to attract inward investment and to prevent transfer of technology and enterprises off-shore. ”***

- In December 2003, the Australian & New Zealand Governments signed an agreement to establish a joint regulatory scheme for therapeutics, to be called the Australia New Zealand Therapeutic Products Agency (ANZTPA). In 2007 the New Zealand Government postponed the creation of ANZTPA.

- Significant evidence of New Zealand based Human Therapeutics companies meeting FDA standards in developing novel products and undertaking Clinical trials.
- Coordination between HSNO (Hazardous Substances & New Organisms), Medicines and ACVM (Agricultural Compounds and Veterinary Medicines) Acts achieved through New Organisms and Other Matters (NOOM) Bill of 2003 which allowed for applicants to apply to one agency, with a rapid assessment provision available.
- Some changes to HSNO & ERMA to improve the regulatory environment surrounding Genetic Technologies including:
  - HSNO now provides for “project” based applications to be made for the development of GMOs for lab research;
  - Import of “low-risk” GMOs can now be approved by Institutional BioSafety Committees; and
  - New “Conditional Release” category allows for greater flexibility for releases of GMOs.

<sup>29</sup> OECD International Futures Programme *The Bioeconomy to 2030: Designing a Policy Agenda* (2009) Chapter 5

- Amendment to HSNO regulations relating to growth of GM micro-organisms in containment vessels & containment approval for small quantities of chemicals sold for research use achieved through NOOM Act which changed classification of large scale fermentations from “field test” to “development” allowing for approval in the same way as other laboratory developments of new organisms.
- Intellectual property law improved through better tax treatment of patents and amendment to achieve the inclusion of “essential derivation” in the Plant Variety Rights Act (on hold until resolution of WAI262).
- The need for improved understanding of Intellectual property widely understood and establishment of resources such as the NZTE publication “An Intellectual Property Guide for Life Sciences in NZ” (2004) and ongoing industry training. However, responses to Statistics New Zealand surveys of the industry indicate that further work is required here.
- Key international negotiations underway which have the potential to significantly impact upon industries which utilise biotechnology:
  - UN Framework Convention on Climate Change (COP 15 December 2009); and
  - International Convention on Biodiversity (COP 10 October 2010).

*“ The OECD identifies that the value that countries will extract from the bioeconomy will depend on their regulatory preparedness for new technologies. ”*

### Recommendations

1. Improve the taxation environment and taxation treatment of small, start-up high risk emerging companies:
  - a. By 2010, develop an alternative to the repealed R&D tax credit to stimulate investment by industry into innovative bioscience enterprises. Such a credit should take account of the needs of firms at various stages of their development and support the requirements of small, start-up organisations as well as larger firms. (e.g Boston Model – Massachusetts offers a tax incentive for research and development investment for both manufacturers and R&D companies.);<sup>30</sup>
  - b. Eliminate shareholder continuity rules for tax-losses carried forward;
  - c. Accelerated depreciation and investment tax credits for capital equipment; and
  - d. The tax treatment of acquisitions, especially as it relates to purchase accounting, in process R&D, and the treatment of good will.
2. Reinvalidate and seek agreement on the Australia New Zealand Therapeutic Products Authority.

<sup>30</sup> This tax incentive was designed to remove any obstacles to R&D investment and spur growth and innovation throughout the Commonwealth. The R&D tax credit closely resembles the federal credit program, however, it specifically offers qualifying Massachusetts companies many unique features for doing business in Massachusetts. The R&D tax credit is available to any foreign or domestic corporation subject to the corporate excise under Chapter 63 Massachusetts Law.

#### Terms and Conditions

- The Massachusetts R&D Tax Credit is divided into two categories.
- The first credit category is a ten-percent credit designed for Qualified Expenses which are defined as any research expense incurred which would qualify for the Federal R&D tax credit.
- The second credit category is a fifteen-percent credit available to Basic Research Payments for any costs related to donations and contributions made to research organisations such as hospitals and universities.
- Unlike many other states, the Massachusetts R&D tax credit is permanent.
- The R&D tax credit can be taken in conjunction with the state’s Investment Tax Credit of three-percent (or five-percent as part of the Economic Development Incentive Program).
- The R&D tax credit may reduce the corporation’s tax to the minimum tax of \$456.

3. Government and industry to work together to identify regulatory solutions that support and encourage bio-based industries where New Zealand has a competitive advantage:
  - a. Review the appropriateness of the Precautionary Principle 8 years on from the RCGM;
  - b. Review the costs (in time and resources) associated with regulatory approval for undertaking research which relates to genetic technologies and put in place pragmatic solutions to minimise costs and time delays;
  - c. Progress the revision of the Plant Varieties Rights Act, which has been on hold since 2004; and
  - d. Adhere to mandated response times for regulatory decisions.
4. Ensure that the Patents Bill currently before the Select Committee of the Ministry of Commerce encourages the development of intellectual property in New Zealand:
  - a. Promote the understanding that critical jurisdictions for Intellectual Property protection for bio-based industries are largely offshore, however a strong NZ regime is essential to protect inventions in their novel stages;
  - b. Incorporate a provision for extension of the patent term for products which require long testing and regulatory time frames before reaching market, to ensure maintenance of a competitive position and ability to achieve a return on significant investment in development;
  - c. Encourage the development of overseas IP in New Zealand, through increased collaborations with large multi-national firms and international collaborations; and
  - d. Undertake to avoid using Patent legislation as a tool to achieve social benefits, and instead treat it as a critical piece of legislation which underpins innovation and new enterprise formation.
5. Consult actively with industry when relating to International negotiations on the International Convention on Biological Diversity and the UN Convention on Climate Change. A position should be fostered that rewards innovation and productivity gains as success and that does not support creation of non-tariff trade barriers through adopting a sociological approach.



## 12 Improving Commercialisation Outcomes

Although the excellence of New Zealand's research, science and technology is widely accepted, there is still ongoing concern about our effectiveness in the transfer of technology from the lab bench, through the commercialisation process into the market.

In the biosciences, commercialisation can take long periods of time and be extremely capital intensive. Often small companies adopt a strategy of out-licensing intellectual property to large market players (frequently internationally owned) and reinvest royalty streams in second generation technologies. Alternatively companies may choose to adopt a co-development or co-marketing strategy, work towards a trade sale and in some cases take the final product to market themselves.

A number of factors are influential in affecting the strategy chosen, including accessibility of markets (size, location, competitive landscape), capital required, investor exit strategies, relative strengths of domestic and international capital markets, strength of intellectual property position, access to clinical trial and manufacturing capabilities, access to major market players and so on. In addition, a culture of incentivising commercial outcomes from innovation is essential, with supportive Government investment schemes and fostering of science-industry linkages.

### *Key issues identified by the Summit include*

- Current Performance Based Research Fund & Crown Research Institute Key Performance Indicators are not aligned to achieving successful commercialisation outcomes.
- Current perceptions in funding agencies that out-licensing intellectual property to major players off-shore and attracting significant Foreign Direct Investment into New Zealand companies is a negative outcome for New Zealand.
- There is a need for infrastructure to support commercialisation and commercialisation capability building.
- The exit of "Big Pharma" has resulted in less commercially oriented health R&D being undertaken in New Zealand.
- A strengthened clinical trials capability will encourage clinical outcomes for health innovation and has the potential to attract commercial R&D back to New Zealand.
- Virtual incubators and clusters are an effective model for a small, geographically dispersed research population.
- Access to world-class scientific infrastructure is critical to undertaking world-class science.
- There is a lack of interaction with and understanding of end-user needs, not only with big Pharma but also other major market players in the primary production, food and energy sectors.

*“ A culture of incentivising commercial outcomes from innovation is essential, with supportive Government investment schemes and fostering of science-industry linkages. ”*

### *Progress to Date*

- Centres of Research Excellence and Research Consortia have resulted in improved collaboration.
- Establishment of the Biotechnology Learning Hub and development of NZBIO news service, which acts to inform and educate high school students through to industry players of the innovations and impacts of new discoveries.
- Trans-Tasman programme for access to the Melbourne Synchrotron.

- Creation of niche providers of clinical trials in key centres (Auckland, Christchurch, Otago).
- MoRST FutureWatch programme closely monitors emerging trends in order to maintain the relevance of policy positions.

### *Recommendations*

1. Provide active support for interaction of technology developers with end-users, identifying their needs and informing the RS&T system and development process to suit the requirements of the market.
2. Undertake a programme of constant upgrading of scientific infrastructure, adopting programmes of shared costs & access across multiple parties (including academic and commercial access regimes) to minimise redundancies in high-cost equipment.
3. Focus on attracting contract research from major international players into New Zealand, to create commercially experience science capabilities and significant industry contributions to the RS&T system in New Zealand.
4. Establish mechanisms to reward commercially focused research and commercialisation by celebrating successes and creating incentive programmes.
5. Invest in the attraction of specialised talent with significant experience in taking technologies into market and establishment of market position and provide access to such talent in the form of training and industry development programmes.
6. Continue to develop strong trans-Tasman linkages with respect to science, enabling New Zealand scientists to access extremely high-cost infrastructure through collaborative agreements (e.g. Melbourne Synchrotron).
7. Allow market driven interaction to determine promising projects for Government investment, accepting that those in industry are the best qualified to identify the most promising projects and provide supporting investment for projects which have already secured industry or venture capital investment (e.g. Australian Commercial Ready programme).
8. Continue to build an attractive exit market by undertaking broader tax reform to promote investment into productive investments (rather than property) and further development of the NZX as a vehicle for public investment into high-technology bioscience companies.



## 13 Building a Robust Bioeconomy in New Zealand: Summary of Recommendations

### A FOCUSED APPROACH

1. The Government focuses on the bioeconomy as a key driver for economic growth.
2. Strategies and priorities build on areas of strength (primary production – including food, forage, animal health, agriculture & aquaculture applications; niche areas of human health & industrial biotechnology) whilst supporting emerging capabilities in areas of convergence (functional foods, biofuels, nutraceuticals, fine chemical production, niche manufacturing).
3. The bioscience community is consulted as a set of critical stakeholders of New Zealand's science and innovation strategy.
4. Government investment in RS&T is streamlined to improve access to and understanding of available schemes, whilst ensuring novel, commercially focused science is not excluded through area of application eligibility requirements.
5. Key Performance Indicators and Investment priorities are designed to ensure a balanced view of basic research and commercially focused research, with a focus on rewarding innovation and productivity.
6. Create a cross-Ministry bioeconomy policy working group (a coordinated MoRST, MAF, MFAT, MED, FRST, NZTE group) to work proactively with industry and ensure supportive policy frameworks for the development of the bioeconomy.

### ACCESS TO CAPITAL

1. Continue to actively develop the broader environment to be conducive to private investment (foreign & domestic).
2. Adopt recommendations of the Capital Markets Taskforce with respect to deepening the capital pool in New Zealand.
3. Continue to support industry partnerships but provide better coordination between FRST and MED and reduced co-investment requirements.
4. Encourage and incentivise increased investment in bio-based enterprises:
  - a. From Angel investors through effective, national, coordinated networks and attraction of international Angel investors to New Zealand;
  - b. From NZVIF, ACC and Superannuation funds;
  - c. Through creating new specialty funds to focus on bio-based enterprises, potentially including foreign investors, and
  - d. Explore share market vehicles or alternative investment structures to make it easier for individuals and small investors to invest in biotechnology based companies without the companies having to face the high compliance and establishment costs of being a listed entity.
5. Accessing & incentivising Foreign Direct Investment into New Zealand's Bioeconomy:
  - a. Define geographic priorities for focused incentives to attract investment;
  - b. Incentivise overseas investment into New Zealand's bioeconomy, such as tax rebates or grants for targeted overseas industries and geographies;

- c. Attraction of large industry partners (such as big pharmaceutical companies) into New Zealand to build investment in R&D and therefore create capability and improved commercialisation pathways; and
- d. Expand the size and geography of the Biotechnology Partnership Programme.

### KNOWLEDGE, SKILLS & EXPERTISE: BUILDING INTELLECTUAL CAPITAL

1. Develop incentives for graduates, especially at PhD level, to stay in New Zealand after the completion of their studies. Incentives may include commercial internships, tax or fee relief in return for an agreed period working in New Zealand based enterprises.
  2. Incentivise leading offshore New Zealanders to return to New Zealand to continue their work. The Australian Federation Fellowship programme successfully repatriated a number of international scientific leaders back to Australian organisations, resulting in opportunities for PhD and post-graduate scientists to work in world-class teams and creation of new enterprises from research. Other incentive programmes may include tax relief, fellowships or relocation support and should focus on both technical and business leaders.
  3. Continue to develop a broader economic environment that results in minimal opportunity cost for New Zealanders wishing to return home, including lower personal tax rates, housing affordability, management of off-shore superannuation in a seamless manner, and competitive employment conditions.
  4. Set achievable objectives for population-wide levels of education across New Zealand in the future, and implement broader policy and programmes to facilitate the reaching of these objectives.
- “ Continue to develop a broader economic environment that results in minimal opportunity cost for New Zealanders wishing to return home, including lower personal tax rates, housing affordability, management of off-shore superannuation in a seamless manner, and competitive employment conditions. ”*
5. Support programmes which provide cross-fertilisation of skill-sets and multi-disciplinary qualifications by ensuring that both business and science programmes are actively engaging with each other, highlighting the opportunities in business to science graduates, and the opportunities in the science-based industries to management/ business graduates.
  6. Support organisations, such as NZBIO, to expand programmes to promote the immense career opportunities in the bioeconomy to high school and university students, from both a scientific career and business career perspective.

### THE IMPORTANCE OF BEING INTERNATIONAL

1. Continue to support an NZ Inc presence at key international conferences and tradeshows, working proactively with industry to provide support and tailored assistance programmes.
2. Provide support for companies exploring potential international markets through Export Market Development Assistance programmes.
3. Continue to support investment mechanisms which support international collaborations, preferably discretionary vehicles that can respond to both research and industry collaborations as they arise.
4. Continue to develop stronger trans-Tasman linkages, working actively with industry to identify opportunities for significant mutual gain for both nations.
5. Promote ANZ as a “gateway” to the Asia Pacific region for bioscience based industries.
6. Actively seek and utilise opportunities to build New Zealand’s reputation in bioscience based industries in Asia and the Middle East, in addition to geographies of traditional focus (EU & US). For example, running bioscience focused trade delegations to World Expo 2010 Shanghai and key events in Japan, Korea, Thailand, Taiwan, Singapore, Malaysia and Israel.

7. Support the ongoing collection of key statistics and the publication of collateral to support New Zealand's growing capabilities in the bioeconomy to enable informed markets offshore.
8. Creation of a joint group incorporating Government and Industry tasked with coordinating international promotional activities to sell the benefits of New Zealand's bioeconomy to overseas companies and investors.

## LEGAL, TAX & REGULATORY ENVIRONMENTS

1. Improve the taxation environment and taxation treatment of small, start-up, high risk emerging companies:
  - a. By 2010, develop an alternative to the repealed R&D tax credit to stimulate investment by industry into innovative bioscience enterprises. Such a credit should take account of the needs of firms at various stages of their development and support the requirements of small, start-up organisations as well as larger firms;
  - b. Eliminate shareholder continuity rules for tax-losses carried forward;
  - c. Accelerated depreciation and investment tax credits for capital equipment; and
  - d. The tax treatment of acquisitions, especially as it relates to purchase accounting, in process R&D, and the treatment of good will.
2. Reinvigorate and seek agreement on the Australia New Zealand Therapeutic Products Authority.
3. Government and industry to work together to identify regulatory solutions that encourage bio-based industries where New Zealand has a competitive advantage:
  - a. Review the appropriateness of the Precautionary Principle 8 years on from the RCGM;
  - b. Review the costs (in time and resources) associated with regulatory approval for undertaking research which relates to genetic technologies and put in place pragmatic solutions to minimise costs and time delays;
  - c. Progress the revision of the Plant Varieties Rights Act, which has been on hold since 2004; and
  - d. Adhere to mandated response times for regulatory decisions.
4. Ensure that the Patents Bill currently before the Select Committee of the Ministry of Commerce encourages the development of intellectual property in New Zealand:
  - a. Promote the understanding that critical jurisdictions for Intellectual Property protection for bio-based industries are largely offshore, however a strong NZ regime is essential to protect inventions in their novel stages;
 

*“ Consult actively with industry when relating to International negotiations on the International Convention on Biological Diversity and the UN Convention on Climate Change and foster a position that rewards innovation and productivity gains as success and that does not support creation of non-tariff trade barriers through adopting a sociological approach. ”*
  - b. Incorporate a provision for extension of the patent term for products which require long testing and regulatory time frames before reaching market, to ensure maintenance of a competitive position and ability to achieve a return on significant investment in development;
  - c. Encourage the development of overseas IP in New Zealand, through increased collaborations with large multi-national firms and international collaborations; and
  - d. Undertake to avoid using Patent legislation as a tool to achieve social benefits, and instead treat it as a critical piece of legislation which underpins innovation and new enterprise formation.

5. Consult actively with industry when relating to International negotiations on the International Convention on Biological Diversity and the UN Convention on Climate Change and foster a position that rewards innovation and productivity gains as success and that does not support creation of non-tariff trade barriers through adopting a sociological approach.

### IMPROVING COMMERCIALISATION OUTCOMES

1. Provide active support for interaction of technology developers with end-users, identifying their needs and informing the RS&T system and development process to suit the requirements of the market.
2. Undertake a programme of constant upgrading of scientific infrastructure, adopting programmes of shared costs & access across multiple parties (including academic and commercial access regimes) to minimise redundancies in high-cost equipment.
3. Focus on attracting contract research from major international players into New Zealand, to create commercially experience science capabilities and significant industry contributions to the RS&T system in New Zealand.
4. Establish mechanisms to reward commercially focused research and commercialisation by celebrating successes and creating incentive programmes.
5. Invest in the attraction of specialised talent with significant experience in taking technologies into market and establishment of market position and provide access to such talent in the form of training and industry development programmes.
6. Continue to develop strong trans-Tasman linkages with respect to science, enabling New Zealand scientists to access extremely high-cost infrastructure through collaborative agreements (e.g. Melbourne Synchrotron).
7. Allow market driven interaction to determine promising projects for Government investment, accepting that those in industry are the best qualified to identify the most promising projects and provide supporting investment for projects which have already secured industry or venture capital investment (e.g. Australian Commercial Ready programme).
8. Continue to build an attractive exit market by undertaking broader tax reform to promote investment into productive investments (rather than property) and further development of the NZX as a vehicle for public investment into high-technology bioscience companies.

*“ It’s my view that we need to put science at the heart of this National-led Government. If we don’t do that we are simply not going to get the economic gains that New Zealand needs and we won’t have the standard of living that we deserve. And it’s not a lot more complicated than that. ”*

New Zealand Prime Minister, John Key



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