Submission by

to the

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT

on the

Advanced Manufacturing Industry Transformation Plan

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BIOTECH NEW ZEALAND SUBMISSION ON ADVANCED MANUFACTURING INDUSTRY TRANSFORMATION PLAN

INTRODUCTION

BioTech New Zealand (BioTechNZ) welcomes the opportunity to make this submission to the Advanced Manufacturing Industry Transformation Plan (ITP).

BioTechNZ is a membership-funded organisation. A diverse range of members share a desire to maximise the ways that biotechnology can address many of New Zealand's (and the world's) agricultural, environmental, industrial and health problems.

BioTechNZ furthermore connects innovators, investors, regulators, researchers, social entrepreneurs and interested public. It also helps raise awareness and increase understanding of biotechnology to enable our nation to embrace the best opportunities biotech offers to us daily, helping us live better, healthier and more productive lives.

It takes a practical but information and evidence-based approach, focusing on harnessing the opportunities and addressing the issues. It draws on the active contributions of all members. In 2018, BioTechNZ joined NZTech, the peak body for New Zealand's technology ecosystem.

BioTechNZ supports the comments in the submission from NZTech.

We would welcome an opportunity to speak with the Ministry further about this submission.

THE MISSED OPPORTUNITIES IN THE ADVANCED MANUFACTORING ITP

1) Lack of understanding of where biology sits within advanced manufacturing

This document talks about the Revolution (Industry 4.0). However, BioTechNZ believes that there is a significant lack of recognition in New Zealand that biology plays a significant part in this revolution.

*"This Fourth Industrial Revolution is characterized by a range of new technologies that are fusing the physical, digital and **biological worlds**, impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human."*

New Zealand is one country that doesn't have a biotechnology or bioeconomy strategy. This would be acceptable if our government initiatives had weaved biotechnology into our existing strategies or understood the role that biology plays in creating a cleaner, more sustainable, country, as some of the essential building blocks are derived from renewable biological resources, however this is not the case.

As quoted in the BioTechNZ Report 2020[1] "Biotechnology should also be included as an enabler within each of the Government's Industry Transformation Plans (ITP). For example, agri-bio will play a crucial role in the transformation of the New Zealand agri-sector and should be included in the Agritech ITP. Likewise, the Manufacturing ITP must include bio-manufacturing opportunities."

[1] AOTEAROA NEW ZEALAND BOOSTED BY BIOTECH, Innovating for a Sustainable Future, November 2021. Biotech-Report-2020_online.pdf (biotechnz.org.nz)

The Emissions Reduction Plan has been the first plan recently to mention a 'Bioeconomy Strategy', but there is no detail about the plan to date.

A) Lack of biotech companies across this creation of the ITP

This is seen by the makeup of the **Advanced Manufacturing Steering Group**, **Working Group**, and **Partnership Groups**. There is a significant lack of biotechnology companies consulted from the advanced manufacturing space. In the BioTechNZ Report 2020, there are 211 companies identified in the biotech space [2].

BioTechNZ also believes there is a lack of connectivity across the ITPs. It believes they should all be linked, as there are crossovers which enhance each ITP significantly.

B) Putting the 'bio' into advanced manufacturing

The global perception of biology has shifted from a natural phenomenon to a technology that is fundamentally 'programmable' through genetic code (DNA) - "molecules are becoming the new microchip". The biomanufacturing revolution can help us address our gravest challenges, from microplastic pollution to pandemic prevention and preparedness.

Advanced manufacturing sits across all sectors: agriculture, environmental, industrial, and human/animal health. Biomanufacturing/bioprocessing is the process of using living systems, particularly using plant cells, animal cells, enzymes and cultures, to produce commercially important biomolecules for use in the agricultural, food, material, energy and pharmaceutical industries.

There are two parts to "innovative manufacturing:"

1) The biomanufacturing to make the product (the innovative product, eg, the new vaccine)
2) The manufacturing (innovative pieces of kit to make the innovative product)

These are some New Zealand examples:

Human and Animal Health

The COVID-19 pandemic has shed a light on the strengths and shortcomings of the global biotech infrastructure in relation to pandemic readiness and general support of biotech innovation. Globally, governments and industry have taken notice and billions of dollars in new funding is being poured into the biomanufacturing sector at unprecedented rates.

The current pandemic has highlighted the need for advanced biomedical manufacturing within New Zealand. New Zealanders are aware of the importance of vaccines, rapid antigen tests and PCR testing. New Zealanders over the age of 10 have directly engaged and benefited from the use of these technologies. There has never been a better time for New Zealanders to engage in local advanced biomanufacturing. New Zealand, like many South Pacific nations, is heavily reliant on imported medicines and has virtually no capacity to manufacture many of the life-saving vaccines or therapies we use today.

New Zealand as a country does not have the best track record of developing medicines and bringing them through to the clinic. Therefore, shouldn't we just leave the discoveries to the rest of the world

[2] Biotech-Report-2020_online.pdf (biotechnz.org.nz)

and wait for them to come through onto the New Zealand market? Many would argue that this approach has historically not served us well.

Here are a few examples of New Zealand companies and research centres"

South Pacific Sera

A South Canterbury biotechnology company working towards being the first in New Zealand to manufacture a COVID-19 vaccine is pleased to see Government investing in biotechnology infrastructure. Dr William Rolleston, co-founder and co-director of South Pacific Sera, said he believes the funding for RNA technology and development in the Budget is a step in the right direction.[3]

Malaghan Institute

New Zealand's ability to make its own mRNA vaccines like the Pfizer COVID-19 vaccine is a step closer with the arrival of cutting-edge nanoparticle technology, the first of its kind in New Zealand.

MP Biomedicals

MP Biomedicals New Zealand is a specialised manufacturer of high-quality bovine plasma proteins for use in the biopharmaceutical, animal health and diagnostic industries.

Kode Biotech

Has created a multifunctional 'nanotechnology paint' that is the easiest, fastest, most versatile and controllable platform for temporary modification of any cell, virus, and/or surface (biological or non-biological) within a few hours, enabling new and better therapeutics, diagnostics and consumer products.

BioCell Corporation

Development and manufacturing of vaccines from virus and bacterial sources. Contract manufacture vaccines and sterile injectables – formulating, trialling and registering new products, as well as providing extra services, such as packing and filling.

Argenta

The world's only combined global contract research organisation (CRO) and contract manufacturing organisation (CMO) specialising in animal health. Contract manufacturing, molecule to market, innovative products with global partners.

Industrial/Environmental

Mint Innovation

Mint recovers metals from urban waste and returns them to the local economy.

[3] Timaru biotech company pleased the Government is investing in RNA technology and development | Stuff.co.nz

LanzaTech

Carbon emissions are fed to trillions of carbon-hungry microbes that turn pollution into valuable raw material commodities.

Cetogenix

New Zealand clean tech startup Cetogenix' systems break down a wide range of organic wastes to generate renewable energy and recover other by-products, such as fertilisers and biodegradable plastics, using a combination of chemical and microbiological processes.

Agriculture

BioStart

BioStart is a leading New Zealand biotechnology company specialising in microbial activators and fermentation extracts for use in agricultural and horticultural products. Their products' unique technology uses a blend of beneficial enzymes, bacteriocins, signal molecules and secondary metabolites delivering rapid results.

BioSouth

BioSouth's facility has the capability to work with a diverse range of biobased products including biological agents employed for everything from biopesticides to biofertilisers, animal health and nutrition and even environmental remediation.

Synthetic Biology Companies

New Zealand is lagging behind in synthetic biology, but we are seeing a few start-ups in this space.

Humble Bee

High performance materials, inspired by nature.

Mirüku
Animal-free milky ingredients of nutritional, environmental and functional superiority.

It is important to highlight that in other countries the biomanufacturing wave of new companies, and companies pivoting their products, is driven by the evolution of general 'genetic engineering' approaches in the relatively newly established field of innovation.

2) Lack of desire to push new gene technologies within the advanced manufacturing sector

New Zealand needs to be looking at how it can be competitive on the global stage. We cannot compete if we don't have access to the same tools as other countries and keeping or bringing in international talent will/is very challenging.

Because we don't have the use of modern gene technologies in New Zealand at the commerical level, BioTechNZ can only highlight what we are missing out on.

3) Concerning that the focus is on small incremental steps

BioTechNZ feels that the ITP is heavily focused on incremental improvement of many traditional manufacturers and misses the opportunity to raise the understanding and perception of new biomanufacturing opportunities, such as the importance of biotech manufacturing for better sustainability.

As highlighted, there are a number of companies that are not researching new innovations due to a lack of understanding or lack of regulatory support (unable to use new gene technologies). A significant number of New Zealand companies are start-up size, and will not scale because of the lack of funding, regulatory boundaries, or lack of desire to support these new sectors.

COMMENTS ON THE PRIORITIES

PRIORITY 1: Improving the understanding and perceptions of advanced manufacturing

BioTechNZ agrees that it is key to build awareness of the sector. With regards to a name change, sectors have been sliced and diced till they don't mean anything. Move with caution. What needs to be embraced is the fact that manufacturing plays a huge role in employment, for all skill sets and all cultures. We need to normalise both shop floor jobs as just as important as the innovators; not everyone will be the next CEO of Fisher & Paykel Healthcare. Career training starts right at school, teaching STEM and digital technology, so that our next generation can make their choices around their careers.

Note: Until New Zealand embraces new technologies, eg gene technologies, it will be very hard to either train, keep our talent here, or attract international talent.

PRIORITY 2: Increasing investment in advanced technologies and processes to lift productivity and wages

The New Zealand bioeconomy was estimated at $49.4 billion NZD, and this is underpinned by biotechnology The key areas of growth are new cutting-edge technologies where New Zealand is at the starting line, like many other countries. Human health, environmental, industrial and agricultural solutions are heavily reliant of cutting-edge science, innovation and a can-do attitude to problem solving.

Investment in biomanufacturing is challenging, even with the understanding of the upside; creation of new drugs, reducing independence on non-renewable natural resources, transform the production of food and manufacturing of biomaterials, and promote sustainable and resource-efficient production and the use of renewable resources from land, fisheries and aquaculture, while at the same time creating new jobs and developing new industries. Nevertheless, many parts of the biomanufacturing are characterised by high market volatility and inherent risks, which adversely affect its competitiveness, leading to suboptimal levels of government, private and business investment.

The issue in New Zealand is that it is easy for investors to put money into companies developing apps, as the cost is minimal. However, creating a bioscience business requires a lot of expertise, specialised talent, manufacturing-plant capacity, and time.

PRIORITY 3: Making innovation, R&D and science work for advanced manufacturing

Differences in the funding approaches show that resource-rich countries tend to fund programmes promoting the primary production sector, while countries with fewer raw resources focus on related secondary sectors such as biotech or bio-based chemicals.

The majoring of R&D funding in New Zealand is focused on early-stage innovations. A comprehensive and continuous approach beyond the R&D and pre-commercial stages is missing. More support is needed for companies to commercialise new products and financially support development or upgrading of equipment and production facilities, reducing the risk for companies to go from pilot to demonstration plant phase to commercialisation.

Example: The Ireland of the South Pacific

Is it true that New Zealand is too small to become a global powerhouse in biomanufacturing?

Ireland has a similar population to New Zealand but is a global leader in biomanufacturing. Ireland leads the world in training of bioprocessing scientists and houses both R&D and production facilities of many global biopharmaceutical companies. The National Institute for Bioprocessing Research and Training (NIBRT) in Dublin Ireland[4] is the global benchmark for training in bio-manufacturing. NIBRT does not have a facility in the Asia Pacific region. Taken from NIBRT's annual reports, pre-COVID to avoid the enormous uplift in biomanufacturing investment due to COVID:

2020	2019	2018
Pfizer to create 300 jobs in Dublin, Kildare and Cork	WuXi Biologics to build €216m vaccine production facility in Dundalk	AbbVie Expands Oncology Capability at the Company's Site in Ballytivnan
MSD announces 240 new jobs with expansion at Dunboyne	Legend Biotech Ireland, Ltd. celebrates the official opening of its European HQ in Dublin, Ireland	Sligo MSD is to develop a new biotechnology facility in Dublin, with the expected creation of up to 350 new jobs
Allergan marks opening of new €160m biologics facility in Westport with 63 new jobs	Janssen invests €300m and doubles size of Cork facility	Takeda to invest €25m and create up to 70 new roles in a new facility at their Grange Castle site in Dublin
Regeneron announces 400 new jobs in Limerick	IQVIA expands presence in Ireland - creation of 100 new jobs by global human data sciences innovator drug giant	WuXi Biologics to Invest €325 million to build largest biomanufacturing facility using single-use bioreactors in Ireland
Gilead Sciences to create 140 jobs at Irish operations in Dublin and Cork	MSD seeks permission for major expansion of Carlow plant - Company expects to add 170 jobs to 400-plus already working at manufacturing plant	Phibro Animal Health to establish new biotech facility in Sligo, creating up to 150 jobs
		BioMarin expands its cork facility to add drug product filling capability

Bringing an innovation from that early test phase to full-scale can be challenging, therefore most companies/products struggle to go from bench scale to full scale manufacturing. Engaging with innovative manufacturing practices, process and equipment is key.

[4] NIBRT - National Institute for Bioprocessing Research and Training

PRIORITY 4: Attracting and developing a diverse high-skilled high-wage workforce

The 2016 Scientific American worldwide assessment of innovation potential in biotechnology ranked New Zealand fourth behind the United States, Singapore and Denmark, climbing from 18th position in 2011. The study found that New Zealand has the most PhD graduates in life sciences per capita in the world coupled with a leading medical research sector. However, local industry suffers low access to both production facilities and skills needed to translate the valuable intellectual property of novel therapeutics at a commercial scale, both through the clinic and on to approval and marketing as approved therapies medical research that can underpin the development of complex medicines.

Until New Zealand can use cutting-edge biotechnology we will struggle to train, retain and attract the talent New Zealand needs.

PRIORITY 5: Creating a leading sustainable circular net-zero emissions sector

Recent advances in gene editing offer promising opportunities to mitigate emissions from agriculture and other sectors and to capture carbon from the atmosphere. This ITP should activate and accelerate the development and deployment of these solutions.

PRIORITY 6: Enhancing global connectivity and opportunities

NZBIO the previous biotech membership organisation formed and supported by the government for 10 years and was a successful organisation being active and activated the biotech sector now BioTechNZ, so I agree to creating international connections through trade missions, attending conferences is key and it is essential that ministers and Ministry engage in these activities and with companies.