Ravensdown Submission in response to

# Te Ara Paerangi Future Pathways 2021 Paper

# Background

In 2021 MBIE published a Green Paper entitled Te Ara Paerangi Future Pathways in which they discussed a need to consider how best to position the Research Science and Innovation system to deliver on future needs.

This paper invited submissions from interested parties to enable them to gather a broad base of views relating to issues faced with the current system and opportunities to improve it. The paper suggests that feedback be framed under 6 main headings (set out below)

1. Exploring the role that whole-of-system priorities could play in focusing research activities and concentrating resources towards achieving national goals.

2. Exploring how the research system can best honour Te Tiriti obligations and opportunities, give life to Māori research aspirations and enable mātauranga Māori.

3. Exploring potential ways to reshape the RSI funding system for the future. It covers how funding can be used to give effect to national priorities, reduce unproductive competition, and ensure our institutions can respond to emerging opportunities.

4. Re-examining how we design and shape public research institutions (focussing on CRIs and Callaghan Innovation) to enable them to give effect to national priorities, encourage greater connectivity, and be adaptable in a fast-changing world.

5. Exploring how we best develop our workforce, ensure the RSI workforce is connected, diverse and dynamic and they are offered attractive and flexible careers and career pathways.

6. Exploring effective funding, governance and ownership arrangements for national research infrastructures and how we should support sustainable, efficient and enabling investment in research infrastructure.

Under each heading there are specific questions posed relating to each heading. We note a previous paper from September 2019 entitled New Zealand's Research, Science and Innovation Strategy Draft for Consultation see **(https://www.mbie.govt.nz/dmsdocument/6935-new-zealands-research-science-and-innovation-strategy-draft-for-consultation).**
It states that the current investment framework is designed and maintained to support a range of research, development and innovation activity, from blue-skies investigation to applied R&D, all of which is important to achieving national overall goals. This activity is supported with complementary funding mechanisms. The strategy suggests that stable long-term funding is important to build and grow teams and make significant progress on big challenges and problems, while competitive funding may create dynamism and the opportunity for new ideas albeit with a relatively small research community in NZ. In addition, demand-driven funds offer the opportunity for researchers or industry to use their knowledge to determine the best direction for research with tangible commercial outcomes. Targeted strategic funds enable the government to make directed purchases for the benefit of New Zealand's future. These different purposes and functions mean that the investment system may appear complex.

We consider that many of the aspects outlined above to still be relevant and desirable today. As a result, we pose the question: Is MBIE seeking to change a system that may not be altogether broken?

Ravensdown appreciates that in NZ, science as a career requires building reputations academically which needs funding by Government to build science excellence as evidenced by a strong publication record, but for science excellence to flow into successful outcomes that create impacts for society, there needs to be parallel opportunity for applied science and knowledge transfer scientists.

In our experience, the Crown Research Institutes (CRIs) seem overly staffed with managers and other support staff, a situation seemingly enabled by the MBIE contestable bidding system being a business in its own right. Given the 30-year history of CRIs, if the science system is to be significantly revamped, we trust that the learnings of the past 30 years are reflected in any proposed changes and that it does not take another 30 years to bed in any new system.

In our view, industry partners trying to work within the current framework find access to required expertise very expensive, with researchers being focussed more on purely Government funded work (obviously to ensure longevity of tenure) and tend to regard industry funded work of lesser importance/quality. There is also the issue of adequate resourcing in the applied science area leading to applied science and knowledge transfer scientists being stretched thinly over multiple projects with not much evidence of recruiting for the future.

# Introduction

Ravensdown was formed, by farmers, in 1977. It operates as a co-operative of 19,100 (as at 31/05/21) shareholding New Zealand farmers. The company has the vision of smarter farming for a better New Zealand. While often described by some as a fertiliser company, the farmer owned co-operative is all about essential farm inputs, delivered with smart people using smart tools backed by the latest science to drive nutrient use efficiency. The company's products, expertise and technology help farmers reduce environmental impacts and optimise value from the land thereby creating value for New Zealand.

The company employs over 640 people across the length and breadth of New Zealand of which over 120 are involved in research and development, extension or are farmer facing. Ravensdown is a major player in the primary sector with involvement in many, if not most of the current agricultural sectors. As a result, it is a significant funder and user of innovative research and development services to improve, protect and enhance these sectors.

The company's annual expenditure on R&D has risen from around $2 million in the early 2000's to around $10 million in the financial year 2021/22. Ravensdown works with a significant number of research organisations both within NZ but also internationally. Key research partners are AgResearch, Manaaki Whenua, Plant and Food, Lincoln University, Massey University, SABIC (an international fertiliser company), Lincoln Agritech, Universities of Sydney and Adelaide. We currently have 12 large research projects underway with some of these partners.

As a company with significant user facing staff, we are well positioned within our sector to be aware of both current short-term needs and long-term opportunities and most importantly operate at a scale that can create significant impact when involved in an appropriate manner with researchers.

As a result, Ravensdown feels that its input into this process is valuable and welcomes the opportunity to provide feedback on the Green Paper.

The primary sector and especially the pastoral sector remains a major contributor to the wealth, standard of living and therefore welfare of the nation but does not seem to always be adequately prioritised in terms of Government investment and support of the critical emerging challenges ahead for the agricultural sector.

The agriculture industry in New Zealand has cemented itself as a key economic powerhouse. With a gross domestic product contribution of some 50 billion New Zealand dollars, it contributes significantly to the country's tradeable economy. The farming sector produces a vast number of horticultural, dairy, and meat products which are consumed locally as well as overseas. New Zealand is one of the world's largest exporters of dairy products and sheep meat. The agriculture industry also provides job opportunities for thousands of New Zealanders, especially in the regions. Ravensdown believes this will remain the case for the foreseeable future.

However right now, many of the most immediate and long-term issues facing New Zealand are associated with agricultural practices, while there remains a level of concern about ruminant-based agriculture. These concerns relate to material environmental impacts, compromised animal welfare, zoonotic disease threats and greenhouse gas emissions. This

situation is further highlighted by the recent coverage given to alternative protein sources and their perceived benefits.

Although often not founded in fact or based on scientific principles, many of the negative claims around agriculture, and the number of people who make them, may well increase, thereby placing ongoing pressure on farmers.

Given that agriculture will always be a key component of the New Zealand economy we believe that there is strong strategic merit in seeking to have an ongoing agricultural R&D effort that can provide knowledge, understanding and ultimately solutions for New Zealand's environmental, social, productivity and animal health challenges and opportunities. This will enable New Zealand to have at its disposal an array of scientifically led solutions that can at best solve existing, and pre-empt, future issues and criticism providing timely solutions to such issues as they arise.

Ravensdown urges that consideration be given to this ongoing need and that whatever changes might evolve from the current process the agricultural sector is not overlooked or seen as no longer important.

When it comes to the growing prosperity of New Zealand, stronger rural communities and a progressive, environmentally considerate Agri sector, Ravensdown considers itself to be part of the solution.

We have endeavoured in this submission to, where possible, provide our comments under the six main headings listed above.

## Exploring the role that whole-of-system priorities could play in focusing research activities and concentrating resources towards achieving national goals.

### 1 What principle could be used to determine the scope and focus of research priorities?

The scope and focus of future research priorities needs to be on those areas where New Zealand has a unique problem and where we cannot expect overseas sources to provide the required solutions. Thus, it is important to focus research on issues that will be of strategic importance to NZ moving forward. For example, ensuring agricultural products from New Zealand are of high nutritional quality and food safety produced by systems which co-exist with the natural environment.

It is important that we continue to maintain and develop capabilities in areas where me might be able to lead the world and more importantly where the world will not provide a solution. Enteric methane reduction in pasture fed animals is one example where NZ could lead the world and help make our meat and dairy producers maintain their world leading efficiency with the lowest GHG footprint per unit of product.

From the agriculture sector perspective, areas such as rumen science, water quality, nutrient management, greenhouse gas mitigation and animal health and welfare provide areas where NZ can and should lead the world. The setting of priorities should focus in the main on the major problems/issues facing the country with less emphasis being given to specific opportunities, capability development or a single field of research. While all have a role to play in an overall science funding system, we believe that having a focus on finding a solution to recognised current and future problems will create the greatest impact.

### 2. What principles should guide a national research priority-setting process and how can the process best give effect to Te Tiriti?

Priority setting should be driven by the level of impact a suitable technology might create if applied at scale. Research should target the development of practical and applicable outcomes with a view to how these might be used in the future to deliver solutions and so create impact.

In undertaking this exercise, it should be noted that outcomes (by definition) are usually not under the full control of the researcher(s) or institution(s) that developed the initial outputs. Measures of success in creating outcomes are much harder to determine in that it can take many years for new knowledge to be widely used and applied in various settings, and these uses are often difficult to monitor and track. Complementary inventions and technology are sometimes needed before the full benefits of knowledge can be used, creating lags in full impact generation. In other cases, society may not be ready to adopt the knowledge and financial, regulatory, social and other barriers may prevent uptake.

It is in this latter space where the role of companies like Ravensdown can be important in setting the research priorities as companies like ours can see where the impact may arise, can actively seek (or co-develop) complementary technologies and so enable impact at scale.

To give effect to Te Tiriti obligations, all the above must be done in conjunction with the relevant Māori authorities, iwi, hapū and Māori owned and led agricultural businesses by including relevant representatives at the earliest stages of priority setting and co-developing the outcomes. The research priorities must include te taiao, and mātauranga Māori principles and give effect to Te Mana o te Wai.

## 3. How should the strategy for each research priority be set and how do we operationalise them?

Ravensdown, as with most companies who operate a significant R&D capability, regularly develop their own forward-looking strategic plans designed to best proof the company and its shareholders against future shocks. These plans are based on information derived from a range of sources not least of all from end users, which along with global trends and potential future issues are then analysed and prioritised.

Thus, for the strategic areas of research of importance to Ravensdown we believe we have a good understanding of the key priorities that need to be addressed and how to operationalise those and deliver solutions at scale.

We therefore feel that priority setting in relation to research needs to be undertaken in consultation with industry players who between them will have a good feel for the future requirements, how the research outcomes can be effectively put into action and have 'the route to market' to ensure uptake of the outputs.

We recognise that research priorities do need to be flexible to reflect changes in the national requirements but strongly suggest that for the most part the system needs to be stable in recognition that excellent science can take time. To ensure that there is stability within the research priorities and hence funding streams we suggest that any ongoing management or governance of the priority setting process has an assessment/review process that is based on progress towards the delivery of expected outcomes (as opposed to outputs). As industry participants we feel that industry involvement should be integral in any realignment of priorities.

**In exploring how the research system can best honour Te Tiriti obligations and opportunities, give life to Māori research aspirations and enable mātauranga Māori.**

### 4. How would you like to be engaged throughout the Future Pathways programme?

Ravensdown has had and does have several large Māori Incorporations (e.g., Atihau Whanganui Incorporation, Tainui, Ngai Tahu, PKW) and Māori owned and operated businesses (e.g., Wi Pere) as customers. As a co-operative to which these entities are shareholders and customers, we would be more than willing to engage with the Future Pathways programme as required.

### 5. What are your thoughts on how to enable and protect mātauranga Māori in the research system?

As noted above Ravensdown believes that to give effect to Te Tiriti obligations, all priority setting, implementation and delivery of any new research system needs to be undertaken in conjunction with the relevant Māori authorities, iwi, hapū and Māori owned and led agricultural businesses by including relevant representatives at the earliest stages of priority setting and co-developing the outcomes. The research priorities must include te taiao, and mātauranga Māori principles and give effect to Te Mana o te Wai.

### 6. What are your thoughts on regionally based Māori knowledge hubs?

While Ravensdown is supportive in principle and practice (e.g., we worked with AgResearch and Ngai Tahu to develop a system for assessing the impact of agricultural development on the mauri of the soil i.e., soil health assessments) of the recognition, development and utilisation of traditional Māori knowledge within the local science environment, we are concerned that any such initiative that seeks to ring fence this activity into discrete entities such as Māori knowledge hubs is potentially flawed. Our concerns relate to these entities becoming isolated and struggling for financial support on an ongoing basis. This potential for isolation would seem to fly in the face of a desire to better incorporate such traditional Māori knowledge into science practices across the whole science system. The establishment of several regional research institutes recently as standalone entities and their ongoing struggles to become self-sufficient would seem to suggest that forming new research entities that need to be supported from the same funding pool that struggles to support existing groups might be short sighted.

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### 7. How should we determine what constitutes a core function and how do we fund them?

Core functions will change over time as new opportunities emerge. Knowledge of present and emerging trends will be required by Government agencies, CRIs, Universities and Industry to ensure that the current core functions of the RSI system are appropriate to address the future challenges and opportunities. Core functions should be decided collaboratively with the groups mentioned.

Ravensdown believes that despite any changes that will be made to the current science system, there remains a requirement for science expertise, both academically excellent but also applicable to the real world and with active knowledge transfer to end users, in biophysical sciences (land, water, air, animals, plants, soils), mathematics and biometrics, data science and proximal and remote sensing as examples.

In terms of funding for core functions Ravensdown believes that the greater proportion of this functionality should be supported by bulk allocation of Government science investment funding. Ravensdown has successfully completed an 8-year Primary Good Partnership project in association with MPI and are currently embarking on a new multiyear Sustainable Farming Futures Fund project with MPI which leverages off this core funding. We have found that these mechanisms for creating a coalition of government and private funding and contracting University and CRI science capability has been a very successful private/public partnership.

### 8. Do you think a base grant funding model will improve stability and resilience for organisations? How should we go about designing and implementing such a funding model?

Ravensdown believes, as alluded to above, that a stable non-contestable bulk allocation of funding to support one or more research institutions in terms of infrastructure, management and staff remuneration is vitally important to ensure the continued investment in science and people. In doing this it is hoped that it will provide stability of employment for the development of careers in science (including applied science and knowledge transfer), without the concerns around where the next funding is coming from to support scientists and their work. In addition to implanting a bulk funding model, we suggest a smaller allocation of contestable funding be employed within the organisations to encourage a

degree of competition amongst the staff to come up with and investigate more riskier areas of science. Industry collaboration and funding should be welcomed to provide support and justification to the use of both the bulk and contestable funding pools and facilitate the development of technologies across multiple time horizons to create solutions to both long and short term issues.

In Ravensdown's view, the contestable funding model has failed to deliver on improving efficiency both within and between research providers or in providing industry with a cost-effective research capability to turn to. Any science funding mechanism should allow for competition of ideas and a degree of repetition of research which is an important aspect of hypothesis testing and science methodology. However, the contestable funding model which has been at the heart of science funding in New Zealand for the past 30 years needs to be rationalised. Additionally, it is sometimes difficult for industry to get the research we want delivered at a reasonable price because of the extremely large overhead multipliers levied by both CRIs and Universities.

## Re-examining how we design and shape public research institutions (focussing on CRIs and Callaghan Innovation) to enable them to give effect to national priorities, encourage greater connectivity, and be adaptable in a fast-changing world.

### 9. How do we design collaborative, adaptive and agile research institutions that will serve our current and future needs?

Over the past 40 years, Ravensdown has actively and successfully (in the main) worked with many of the public research institutes and Auckland, Waikato, Massey, Lincoln, Otago and Canterbury Universities.

Some of the issues we have experienced are to do with science culture whereby there can be a lack of interest from science staff in applied type research targeting the development and delivery of commercial products and/or services. Science staff often do not regard this type of output as being important to them or their career. Too much focus on science discovery and publication as a critical determinant of future impact is not always positive for industry as, while the science must be robust and proven, commercial interests want an outcome that creates impact and assists end users businesses rather than produce science publications *per se*. Ravensdown often wants research and development that is paid for by its shareholder's funds published in peer reviewed scientific journals. As a commercial entity though we often require publications to be delayed for commercial reasons (e.g., to obtain first mover advantage).

Strong focus on science excellence that results in scientific publication is certainly a major focus of the academic staff in both the CRI and the University system. Ravensdown constantly experiences this situation across all types of research providers, (except for some staff at Lincoln University), where staff are more interested in the curiosity of discovery rather than the application of the outcomes to real world issues. This can often lead to research being delayed or at times not being undertaken at all.

These experiences mean that unless such work is totally self-funded it is difficult to get leveraged public funding for more applied projects. Additionally, while Ravensdown believes that private/public funding partnerships are and can be very effective for delivery of innovation, the bureaucracy involved in funding applications, especially for MBIE contestable funding pools but even to a lesser extent for the MPI based SFFF fund, consumes a large amount of time, expense and human resource better directed at creating the solutions to issues or opportunities identified.

## 10. How can institutions be designed to better support capability, skills and workforce development?

From the outside, it seems to Ravensdown that the role of CRI's and Universities (apart from teaching) has coalesced over time, leading to inefficient duplication of effort and we suggest that the roles of research scientists within the Universities and CRI's/Research Institutes need to become more clearly delineated. Apart from the teaching functions of University staff, a mix of science excellence research and applied research should be conducted in all organisations, collaboratively where this makes logical sense.

To achieve this, it will be necessary to separate out the funding of pure research (science excellence) and applied research (fit with industry needs), reward delivery of outcomes to industry, and incentivise the right behaviour by not penalising those scientists who do go down more applied science routes. It will be especially important to ensure that all scientists feel more secure in their career paths with more certainty regarding medium to longer term tenure in their organisations. This will also assist in recruitment and retention of succeeding generations of researchers.

## 11. How should we make decisions on large property and capital investments under a more coordinated approach?

Ensuring strategic focus for agricultural research which includes industry input and stable non-contestable funding will contribute towards improved longer term capital investment decisions and alignment between RSI organisations. The mechanism for making large property and capital investment decisions should be based on detailed 'business cases' fully examining the needs to be addressed and the likely returns on the investment. This should not solely be the financial return on assets but rather the return to the whole of New Zealand in terms of social capital and welfare, and balance of payments. CRIs and Universities must work together much more co-operatively to ensure no duplication of investments and a willing attitude to working together to share capital works, equipment and property.

## 12. How do we design Te Tiriti enabled institutions?

See Q5 and 6 above.

## 13. How do we better support knowledge exchange and impact generation? What should be the role of research institutions in transferring knowledge into operational environments and technologies?

In the recent (2019) RSI draft strategy (ref above) MBIE consider that the greatest opportunity to improve the research, science and innovation ecosystem is to improve the degree of connectedness between relevant Government Departments, RSI organisations and industry through the results chain model to enhance the level of impact to advance the wellbeing of New Zealand into the future. A results chain model is

where outputs are created by research that are then used to deliver outcomes, which are the mechanisms that lead to impacts by use or application of outputs.

Ravensdown has found the SFFF system that requires co-investment from an industry participant is an excellent mechanism to increase this connectedness and would support any initiative to see this mechanism for commercialisation increased significantly. Not only has this been a successful mechanism, but also when researchers have been given the latitude and encouragement to work closely with an industry partner like Ravensdown, we have seen successful outputs arise which have created impact e.g., Eco N, Cleartech, Ecopond. This happens due to researchers partnering with industry participants who are both scientifically literate and commercially aligned leading to establishment of mutual respect of the researchers and the industry partners. It enables the development of a culture of good communication and sharing of progress and ideas. The researchers have the science and industry has the path to market and hence a mechanism to create impact from outcomes.

Ravensdown has noted some difficulty working with Callaghan, in that often there is pressure applied to use Callaghan staff to do the work which they have funded, rather than alternative science resources preferred by the industry applicant.

## Exploring how we best develop our workforce, ensure the RSI workforce is connected, diverse and dynamic and they are offered attractive and flexible careers and career pathways.

### 14. How should we include workforce considerations in the design of research Priorities?

Currently there are very few post-doctoral positions available for early career scientists (recently completed PhD) in New Zealand. Subsequently many talented young scientists who have studied in NZ head overseas to gain post-doctoral experience. Helping to create a better pathway from PhD into research careers would help NZ to retain talented young scientists that are essential for the future success of NZ.

### 15. What impact would a base grant have on the research workforce?

As mentioned in Q7 and 8 above, some reasonable proportion (75%?) of the institutional funding should be guaranteed to ensure security of tenure of research staff who do not then have the ongoing distraction of spending upwards of 50% of their working life preparing research bids into already grossly overallocated funding pools with little chance of success. This science resource is surely better employed doing the science. Security of tenure will also reinvigorate the RSI sector by attracting young and emerging scientists to work in these organisations.

### 16. How do we design new funding mechanisms that strongly focus on workforce outcomes?

We reiterate from earlier, that this might require the possibility of rewarding delivery of outcomes to industry, incentivising the right behaviours and not penalising those who do go down more applied science and knowledge transfer careers.

## Exploring effective funding, governance and ownership arrangements for national research infrastructures and how we should support sustainable, efficient and enabling investment in research infrastructure.

### 17. How do we support sustainable, efficient and enabling investment in research infrastructure?

Industry would have more confidence in and be more prepared to invest in national research infrastructures if they were developed to allow private/public partnerships to be more easily created and jointly funded, avoided duplication of research, had much lower overhead structures, no requirement to make a profit and where the science organisations had no cause to develop and retain intellectual property.

We see that there could be some merit in amalgamation of some of the CRIs into fewer bigger entities, thereby achieving some economies of scale in management structures and thus overhead costs.

Government has a key role to play here in terms of leadership. Successive governments have flip flopped through the last 30 years on where investment priorities should lie for RSI organisations. This has led, for example, to AgResearch selling farms and pressures put onto Lincoln University to do likewise. This undermines future capabilities. Additionally, the process of getting capital has become equally as fraught as competitive science funding rounds. The protracted post-earthquake process that Lincoln University and AgResearch (and initially other parties) were put through to establish a Lincoln campus research hub was deplorable. It wasted years of time, the goal posts kept moving, and it was eventually declined by Government.

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