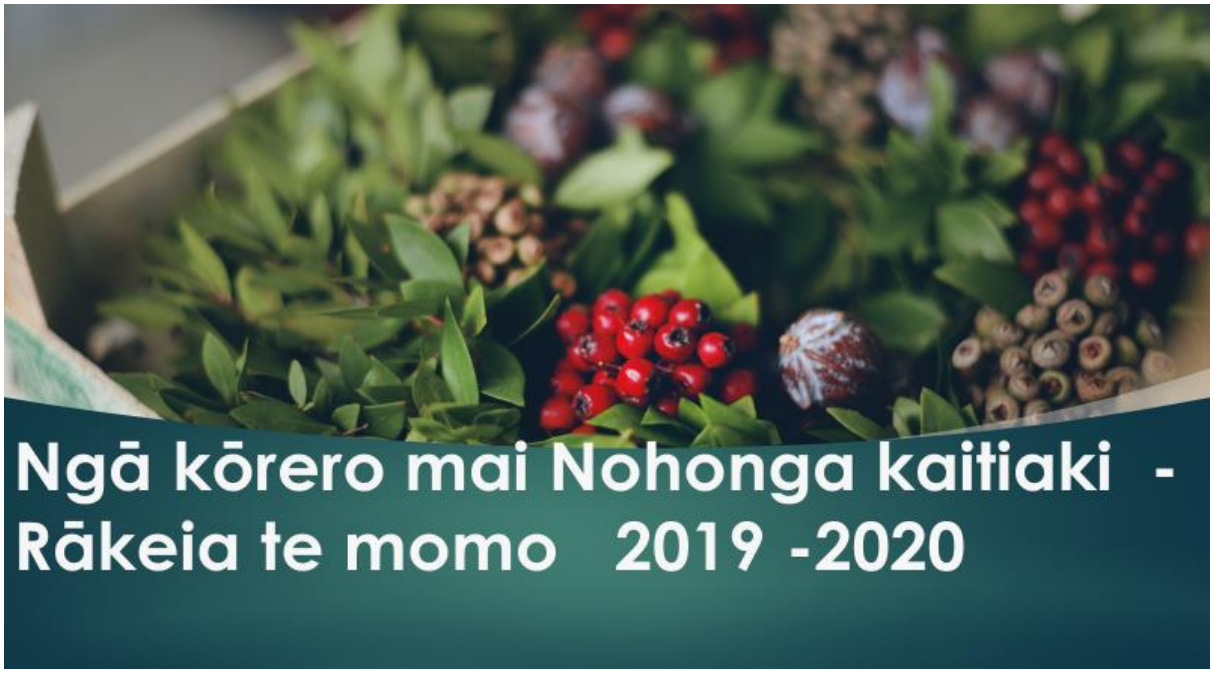
Whitimaia Limited

A report on Turbo Breeding Research Interviews with Key Informants



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1. Introduction:

The insights from these interviews contribute to two research projects **Te Nohonga Kaitiaki** a Genomics Aotearoa funded research project that aims to develop culturally informed guidelines for genomic research with taonga species – led by Waikato University. The guidelines will support researchers to work appropriately with Māori/Iwi communities in the generation, storage, and use of genome sequences for Taonga species and Indigenous biota including advice and model pathways for commercialisation and benefit sharing. Currently there are no culturally informed, ethical guidelines for researchers generating genetic information on Taonga species. This project will contribute towards enhancing research practice, recognising Māori rights and interests in Taonga species and developing meaningful outcomes for Māori communities from genomic research on Taonga species.

The second project, **Rākeia te Momo** is part of a larger project being led by Plant and Food Research and explores the co-innovation interface. It is called turbo 'Turbocharging Plant Production' which aims to accelerate plant breeding using gene-editing technologies.

A key part of both projects is identifying the potential positive and negative implications of this type of research on Māori communities, whānau, hapū and iwi. In particular, the questions aimed to ascertain the level of involvement of Māori in both undertaking genomic and other types of scientific research and in the commercialisation of these types of research. From the interviews, participants provided insights around their perspectives, experiences, and expertise in either genomic research or commercialisation or both. Most importantly, participants raised issues around the perceived value of the research, who benefits from it in the long run and how is Māori knowledge, whakapapa, and traditional native plants and taonga species protected and commercial benefits shared with Māori.

All of the concerns mentioned emerge from limited Māori engagement and involvement in genomic research or its commercialisation and therefore researchers based in institutions, CRI's and Universities for example, are encouraged to purposefully engage with Māori. Many concerns for Māori are ethical and include loss or lack of control over the research at various points in the process; inappropriate interpretation and manipulation of data without consideration of the impact to Māori, their knowledge and wellbeing; and the practice of commercially exploiting naturally occurring biochemical or genetic material, especially by obtaining patents that restrict its future use, while failing to pay fair compensation to the community from which it originates. All participants referred to concerns relating to the latter issue of biopiracy. But all participants mentioned potential benefits of Māori participating in genomic research which included health benefits, new knowledge, products, processes, intellectual property, Māori culture and values.

Of the people who participated in the interviews 10 were Māori and seven non-Māori. Five women in total participated in the interviews and three of those were Māori women. We engaged with seven Māori men four of whom owned their own businesses and just two of those were actively involved in commercialisation of genomic research or their innovations and one

was preparing to become involved in commercialisation of genomic research. Apart from those four who owned businesses the rest of the Maori participants worked as iwi engagement managers or liaison for organisations such as CRI's, or other research institutions. Three of the non-Māori participants had their own businesses and two focused on commercialisation of genomic research and one focused on genomic research.

Table 1 Summary of participant demographic

Ethnicity	Male	Female	Own Business	CRI/Uni	Other Private companies
Māori	7	3	4	6	0
Non-Māori	5	2	3	2	2

2. Methodology:

Our methodology for the interviews was to interact with our participants as much as possible in kanohi ki te kanohi/face to face interviews. However, time constraints of the research team leaders, and also the time of the year, were limiting factors in getting the interviews completed before Christmas. This meant as much as we could, we had to undertake interviews via ZOOM. We tried a couple of different ways and practiced before we undertook the first interview. however, utilizing technology means you need to ensure that other aspects or elements that support the technology. For example, ensuring that internet connections for both participant and interviewers is good quality and can support the technology. Depending on different times of the day the internet varied between strong and weak. All participants were very obliging and happy to undertake the interview via ZOOM or audio. Just two participants preferred the phone interview which was recorded and transcribed.

We completed 17 interviews before the end of the week ending 20th December 2019. From the original list of 21 people two declined to be interviewed, three were not approached because they had been involved in a previous research interview by a member of the team and our team manager suggested we not include them at that point. Three others did not respond to emails or phone calls. So, of the original list 12 people participated and from these people we asked for referrals, that is, other people involved in genomic or gene editing research or commercialisation of research, who we could interview. Through this snowballing technique (Patton, 2002) we recruited 6 more people who agreed to be interviewed.

Overall, participants came from a range of backgrounds although all had been involved in science projects and research at some time and had some knowledge of genomic research. Some were utilising their knowledge in science to support commercialisation of research and others using their knowledge of science to better engage or inform Māori communities specifically and other communities in general. The Māori participants had strong cultural

affinity with Māori and other indigenous cultures, an understanding that was utilised to guide and support research especially in the CRI's and Universities.

We provided each participant with a koha to thank them for their participation. We chose the the book *Tikanga Māori: Living by Māori Values* by Sir Hirini Moko Mead to be an appropriate koha for this project given the kaupapa

Participants were provided numerical identifiers (eg. TB601 -TB617) and in the matrix table the use of fictitious names were used to provide examples of where and how an issue might contribute to an outcome.

3. Insights from Interviews:

Utilising the questions from the interview schedule this section highlights issues, aspects, or perspectives that in many cases were not too dissimilar from each other. There were no hard core strictly commercialisation proponents, there was always some consideration of the cultural and environmental impacts. However, almost all mentioned that there were organisations, individuals and groups of people that were unscrupulous and had or would abuse or take advantage of others to get what they wanted from this type of research. So, very clear messages around being cautious, holding people accountable, and making sure engagement with others was transparent, honest and with integrity. Most of all there needed to be strong elements of trust:

> "*who do you trust, how do Māori know who to trust*" (TB601).

All of the participants agreed that there should be a Māori or indigenous voice in both types of research and in the commercialisation aspects. However, they also agreed that often Māori communities or business-people were often at a disadvantage and lacked the resources, capacity and capability to take their ideas, products or taonga further. Many of these were still in early stages and would likely not benefit from their research for a number of years. Of course, iwi groups like Ngai Tahu and Tainui can control what and who benefits from these types of research and were big players in the area already but were also protective of the matauranga Māori and the IP around research. Many also agreed that this work may also not be a priority for many Māori /iwi who contend with competing realities of whānau, hapū and iwi on a daily basis:

> "*genomic research or even research of any kind maybe the last thing on the agenda for Māori /iwi who have more urgent matters to deal with*" (TB605; TB615).

Both Māori and Pākehā who were interviewed advocated for Māori or indigenous views and perspectives to be acknowledged and/or included in research and commercialisation activities and initiatives. Māori participants were very clear and articulate about how, when and why Māori communities should always be involved. Māori participants were notably influenced by past, present and future thinking inter-generationally, the impacts on Papatuanuku, whakapapa, environment and future generations. Even those focused on commercial opportunities identified spaces and places for the utilisation of Māori and or indigenous values in the research and commercialisation activities such as whakawhanaungatanga – relationships, meaningful collaborations, and social connectivity, manaakitanga – supporting and nurturing others, kaitiakitanga – stewardship, care and protection. Many apply these in their everyday work and those working as liaison or advisors to non-Māori scientists and or researchers were clear that they often had to re-explain or re-educate their colleagues sometimes on a daily or weekly basis. One manager stating emphatically that they:

> "…would not put scientists and Māori community members in a room alone together" (TB605).

Overall most agreed that there were huge benefits and gains to be made in both types of research as well as with the human genome especially in health and the potential to improve health for all. However, it was also noted that given Māori are a relatively small proportion of the total NZ population, identifying or developing drugs that would only benefit Māori would not be seen to be economically feasible therefore the equity or inequity issue for Māori would always remain a challenge. The basic tenet or question that emerged from the interviews was establishing who stands to benefit from the research. Most also suggested that 'who stands to benefit' should always be front of mind.

All interviewed seemed to have the same cautious or no-go attitude – towards the debate around genetic modification (eg using tissue and skin from a pig to make an ear for a human is deemed to be interfering in whakapapa - mixing animal with human is a no-go area for Māori). Currently genetic modification is not allowed in NZ but it is in other countries and so there are very likely to be genetically modified products etc available in NZ anyway. All the Māori participants agreed that Māori need to be engaging in the conversations around these issues and the types of research going on so that *"we are not left behind – we need to prevent things getting past us without us knowing"* (TB608). Suggesting that Māori/iwi should be actively involved in the space and communicating information back to their communities all of the time.

Nearly all participants suggested a stand-alone Māori Science Research organisation, institute, should be established where genomic research could be encouraged for, with and by Māori. There were strong suggestions for Māori to identify native, traditional or Matauranga Māori aspects of research and to have these patented, copyrighted and IP protected before others see the opportunities and do it ahead of us. Ethical processes were discussed at length and how the Treaty of Waitangi Wai 262 should be adhered to more fully. One participant suggested that in many ways

> *"we are lucky to live at the bottom of the world because northern hemisphere indigenous peoples have had their rights abused for a long time but if we don't do anything then we will end up the same"* (TB612).

Most participants also understood the myriad of reasons why iwi, hapū and whānau might not prioritise genomic research (ie social, cultural, educational and environmental disparities take priority) but accessing more resources to build Māori capacity and capability in science is necessary. These were also identified by participants as being barriers to Māori participation in science as well.

4. Interview Questions

Question 1 was directly related to the key informant, who they were, where they were from and how they came to be working in the field of genomic research or have an interest in the area of this type of research or commercialisation generally. There were a mix of Māori and non-Māori participants identified by the research team or if those were unavailable others were referred. All of the participants were identified because of their involvement or perceived involvement in this type of research or were experts in areas of commercialisation of research and or were

competent in te reo Māori and tikanga Māori and well respected in their communities and in their chosen professions. (see biographies Appendix 1).

> *one of the core foundations of my whānau is whakapapa Māori, so for me, it's been handy to be able to simply take a whakapapa lens to this science and try and translate its various elements to kaupapa Māori or te ao Māori lens when I'm speaking to Māori communities (TB612)*

Working with Māori

Māori participants had wide ranging experience of working in Māori communities at different levels and in different capacities. Some travelled quite extensively so that they could participate in iwi/hapū and or whānau organisations and at the same time work in a government agency. Many saw themselves as being the liaison between Māori communities and the science research communities with most wishing that there were many more of them working in especially the CRI's:

> *...we interact with a lot of institutions and researchers... engage with a lot of Crown entities and find out whether those institutions could lower their barriers to development (TB612)*

> *We are relationship managers or connectors, we connect the scientists/researchers with the Māori communities (TB615).*

Some participants who were not part of a CRI or University were highly critical of the of these institutions for their lack of real engagement with Māori communities. These participants who were in external organisations or businesses had worked hard to develop relationships with their local tangata whenua groups and maintain the need to always be engaging with them even when the project may have ended the relationship remains strong.

> *We don't have as much engagement with Māori organisations as I would like...we are working with mana whenua in the South Island who are doing some work on a type of crayfish* (TB601)

> *In NZ most of the CRI's are about commercialisation first and foremost*

Genomic Research

Two or three people were very up to date and highly informed around genomic research, gene-editing, and turbo breeding. One suggested that using words like 'turbo' provided different perceptions and may put some community people off because it implies something happening really quickly – mixing genome to speed up a product maturity before its time. He suggested that another word might be appropriate.

The rest of participants were knowledgeable in their fields for example legal implications both positive and negative around this type of research, plus the impact on Treaty of Waitangi. People in the health and medical professions were deeply knowledgeable around potential health and medical benefits of genomic research. Also those experts working in horticulture,

agriculture and other plant and food groups were highly articulate around their own area of expertise.

> I think fundamentally I'm a strong believer in the nature and nurture argument. I think nurture is a huge part of culture and society but fundamentally genomic research is going to the nature core. There are differences…Yeah that's a really dangerous, dangerous thing. It could be used as a weapon in many ways from social engineering to even like targeting. …everyone's has advertising, right? If you can synthesise what your specific customer is at a genetic level I mean that's quite a powerful tool. I think it needs to be highly regulated; highly controlled and there needs to be at least several advisory committees and ethic committees to ensure that the knowledge that's been gained is for good (B603).

Commercialisation

Questions 5 and 6 related to determining the understandings people had of the commercialisation of genomic research and their views on access and benefit sharing with indigenous people.

> …commercialisation it's very hard, well it's impossible to commercialise without capital. Talent tends to go where the capital is and so I think in New Zealand one of the main commercialisation challenges continues to be an underfunded innovation sector, from a private sector funding standpoint. Actually, it's quite well funded from a public sector standpoint, but that I think in genomics is one of the big challenges, because typically the timeline… is longer …You're going to need field trial results. If you're doing human, you're going to need clinical trials results, you need regulatory approval; these things take years…(TB610).

All participants understood and were aware of the implications both positive and negative of the commercialisation of genomic and other types of research. Most of the Māori participants identified though, that when it comes to sharing commercial benefits, the Māori partners seem to be the ones that come off second best if they receive anything at all. Sometimes the commercial benefit does not happen for a while after the project is completed. Which is why the Māori and some of the non-Māori participants suggested that these potential commercialisation aspects need to be fully explored at the beginning by both the communities involved and the CRI's or other commercial entities and researchers.

> My experience and understanding is that most of it is hidden behind commercial sensitivity and breaking past that is quite difficult. So, even knowing that there's an opportunity for uptake is very difficult to find, to know there's something there that we could benefit from commercially. The experience of trying to establish what that is and identify how Māori can benefit is really tough because institutions guard that very jealously because for them there's revenue stream. Again, they will say we want to sequence and study this thing to increase our knowledge, for the sacred cow of knowledge

development, but as soon as it comes to commercial opportunities the door is closed (TB612).

Māori Participation

Questions 7 – 13 attempted to elicit the level and range of Māori participation in the areas of genomic research, and then Māori participation in commercialisation of research. Then there were questions relating to both genomic research and its commercialisation and how Māori might be involved, whether they should be involved, what prevented their participation and what enabled their participation. Finally, questions related to how improvements could be made to increase Māori participation in research generally were asked.

> *There is huge potential for Māori to be involved in this space Just because they are major players in the Agriculture sector. Lots and lots of good things can come from this type of research and Māori should be involved in the discussions now but also need to be cautious. (TB601).*

Generally, participants agreed that genomic research is an exciting area to work in given the availability of technologies and tools. There is an abundance of types of genomic research and much of it does not need to be tied up in large institutions, Universities or CRI's anymore. These institutions are more well known for their gatekeeping practices where access to research is in the main kept to a few. Genomic or any science research can now emerge from communities and be driven by Māori communities. Participants all acknowledged the work on the *miro berry* and the work in Ngāti Porou by those involved in Hikurangi Enterprises. Plus, many participants referred to community projects where genomic research is used on conservation, developing bioactives, and monitoring climate change. An enabler for Māori participation in genomic research is also about democratising the tool kits, opening the gates and creating the jobs once Māori have moved through their learning and training. Building rangatahi capacity then, might be getting formal training but at the same time being that connector into the community.

Some non-Māori participants generally relied on their Māori colleagues to broker relationships with Māori and some clearly could not see how their genetic research with plants or animals connected or linked to Māori:

> *It's not an area that I have any real expertise in, to understand. I think I'm generally aware that there's some cultural considerations, maybe even some legal considerations in that area; but it's not clear to me what they are or how they may intersect with some of the work that we're doing… I'm certainly a little uneducated about what the implications with a Māori perspective might be (TB602)*

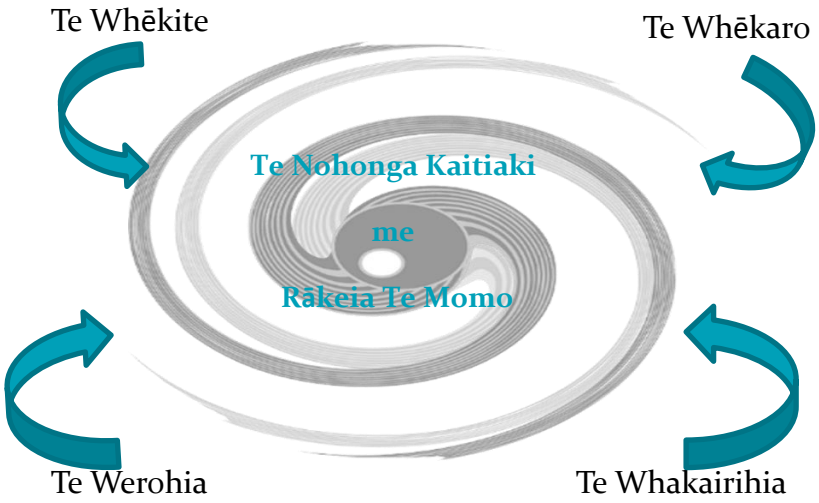
A Proposed Model to Evaluate Interview Responses

The following model was developed in 1991 by Pouroto Ngāropo - Ngāti Awa, Te Arawa, Ngāti Pūkenga, and Tūhoe descent. The model assists in the understanding of interviews that were undertaken in November and December 2019 for the Nohonga Kaitiaki and Rākeia Te Momo project 2019/2020.

Ngā Kete o te Wānanga – Baskets of kōrero and knowledge

The model contains four kete:

- **Te Kete Whēkite** - Consists of knowledge pertaining to karakia and whakapapa. Affirms that all aspects of creation have whakapapa ie human, plants, animals, land, water, seen and unseen including cosmological space.
- **Te Kete Whēkaro** - Consists of the knowledge we learn in life, from the time we are born, and from the time we take our last breath on Earth.
- **Te Kete Werohia** - Consists of all things that we are challenged with.
- **Te Kete Whakairihia** - Consists of knowledge and wisdom.



Āwhiowhio / Spiral: Connection, continuation, movement, endless.

Centre: Signifies the Nohonga Kaitiaki and Rākeia Te Momo project from inception to the present. Continually grows.

Nga Kete: Separate but connected. Relationships, growth, development, challenges, strength, knowledge

All of the kete identified above are connected and participants talked about engaging or being connected to or being the conduit to iwi/Māori communities. Many suggested a focus on building long lasting relationships, better communication and enabling communities to participate in genomic research. All acknowledged the many challenges that have been faced and those yet to come but all agreed that it is an exciting space to work in. Building Māori capability and capacity in the bio-tech and science disciplines was of major concern and both Māori and non-Māori participants were in agreement that something needs to be done to remedy this anomaly urgently.

The model is explained in the matrix below with a few anonymous examples:

Table 2 Matrix to evaluate kōrero

NGĀ KETE WĀNANGA	Kete Whēkite	Kete Whēkaro	Kete Werohia	Kete Whakairihia
Tangata uiui Interviewee	**Whakapapa Genealogy**	**Matauranga Values/ beliefs**	**Ngā Manukanuka Challenges**	**Ngā Whakakapi Outcomes**
Eg. Haare Rua	Te Arawa	Important for CRI's etc to include Māori in research with taonga species	Some CRI's etc do not think they need to consult with Māori	Create Māori research institute /organisation
Eg. Mere Mete	Taranaki	Draw from Wai262 and Matauranga Māori	Western ideology privileged in legislation eg. IP	Māori to get in first and patent ideas, taonga, etc so as to protect for future generations
Eg.John Smith	America	Biopiracy is alive and well – individual versus collective benefit	Unscrupulous bioprospecting with a focus on private commercial gains	Policy and legislation to protect rights and sanctions placed on bio-piracy activities
Eg Hans Smidt	South Africa	Communicate with Māori communities in their language. "ko te kai o te rangatira ko te kōrero" kia Whakamohio me kia whakamarama	Getting Māori involved in genomic research generally, debunking the myth that all genomic research is bad	Better health, better agricultural, better commercial outcomes for Māori and New Zealanders generally

References:

Patton M Q, (2002) *Qualitative Research and Evaluation Options* (3rd ed.) Thousand Oaks, California. Sage Publications

Appendices:

Appendix 1 Participants Biosketches

He wahine tenei working for a government funded research group in Auckland	Ko Te Arawa te waka, ko Te Arawa te iwi. I grew up in Rotorua and brought up my four children there, and only recently moved to Auckland in the last few years. I have a varied history, but my background is in business; so I create and have been running little businesses right up until the last one where I was employing 30 staff. Previous to this role I was working with a Māori organisation in Rotorua as an advisor and initially got sent here on secondment and just kind of fell in love with science and technology. I really felt like Māori business and Māori ways of thinking, plus science and technology, was a real opportunity for Māori and so I stayed and that's probably it. I never saw myself in a government department, I must say, so it has been a learning curve working for the government after being my own boss for so long. But lucky I've got a thick skin and I get into trouble and make mistakes and, it doesn't bother me too much.
Executive Director Biotech NZ AUCKLAND	I'm the current executive director here and I am innovative, commercially astute and highly experienced senior leader, with a career overseeing multimillion-dollar projects and initiatives across the biotech, agritech, health, and local government sectors. With over 7 years' experience in commercial and senior roles, I have provided advice and led projects that span strategic development within Auckland, research within biotechnology and health, business promotion within the food and beverage sectors, and creation of new tertiary education programmes. My broad capabilities include strategic planning, financial management, business development, sales and marketing. In my current role the previous CEO and I have revamped the organisation quite a bit. When it was first established in 2002 there was quite a large amount of government funding provided. With that funding they pulled together a number of other organisations to undertake this work and at one time there were ten people employed here to support the organisation and its membership, so it was thriving. We were across New Zealand; we had delegations overseas and we had a very good name - had a very good brand. Unfortunately, the organisation over promised and under delivered, which is basically what happened, and the funding stopped probably around 2012; 2011-2013, somewhere around there. From there the organisation has kind of limped along, because the problem with our members is that most of them are in that start-up phase. It's a real challenge to run an organisation with small amounts of funds.
He tane Pākehā tenei mai Ireland. Commercialisation Manager Hamilton	I am a Commercialisation Manager for a government entity so it was through the Ministry for Business Innovation and Employment; MBIE is our boss. We support the commercialisation of science from our publicly funded research organisations. So all the universities, CRI's have a 'uni services' type organisation that looks after their commercialisation and we support those organisations as well. As long as they are publicly funded through the government they are eligible for our support, and our support is around through - we have two sort of bodies who are part of us. We have funding so we manage a fund that is dedicated for the commercialisation of ideas coming from our universities and CRIs. The other half of what I do is supporting awareness capability building entities around researchers to think about commercialisation and what does it mean,

	how does that add to their skills sets, things like that. This whole element of mine is more about capability building. My other side of my hat is looking at applications that are coming from those organisations for commercialisation of ideas. We are based in Hamilton, a group of ten people all up. A couple of us are in Auckland and we also have a person that's down in Christchurch as well. But the majority of us are based in the Waikato. My background, I am in neuroscience, I was a scientist, a PhD in Neuroscience. I went and worked overseas in the States for many years before coming back to New Zealand and then working for ERMA, the Environmental Risk Management Authority at the time, and now it's EPA, the Environmental Protection Authority. Again, because of my background in genetics, GMOs, genetically modified organisms are regulated in New Zealand and so my job was sort of the advisory around applications that come out of that giving the advice around the risk profile. About seven and a half years ago I joined the current organisation and so I've been a scientist, I've regulated science and now I see us as KiwNet as an enabler of science through funding via the commercialisation process.
He Tane Pākehā tenei mai Palmerston North. CEO of research and development company	I have worked across the range of sectors including with other business-people, universities, councils and others who have wanted increase the level of commercialisation in their organisations. We started our current business/company off and started off quite humbly, doing business incubator work and over the years we have become more and more sophisticated. So we do entrepreneurial work in schools and young enterprise with youth in high schools through to programmes for technology based start-ups and investment; and we are also a venture partner for a US based venture capital firm, so do investments into, you know, growth stage technology companies.
He tane Maori tenei mai Palmerston North. Relationship Advisor	My father's side is Ngāpuhi, Ngāti Hine. He's from Matawaia Kaikohe. My mother's side we whakapapa to Tauranga Moana, Ngāti Ranginui. They're from Te Puna, Paparoa Marae. My current role here is stakeholder relationships manager for Māori. The role entails Māori liaison really, so connecting our scientists to Māori and Māori organisations and connecting Māori to science and just improving the understanding they have of science and talking about how, through the use of science what benefits are there for them. If they are undertaking the use of science to maybe develop some recently returned land that they may have and maybe looking to utilise more productively. So, a lot of it is liaising or just more a connection role with Māori and science. I've been in this role for around about eight years, coming up nine years. Prior to that, I was a research associate working in the vegetable and plant disease space and the main focus in that area that I was working on was fungal disease in potatoes called potato blight as well as target spot which is a rot that affects the quality and even the quantity of potato production, so a key focus on that area as well as looking at the rest trying to reduce the disease incidence amongst the rest of the crops like broccoli and cabbage and the like. Prior to that, I was a field technician, working or mainly growing cereal crops – wheat, barley, oats, corn and the like. Main purpose for doing that was for breeding programmes in the northern hemisphere as well as the plant and food breeding programmes. It's a method they utilise to get two growing seasons in one year, utilising the complimentary climates of both the north and the southern hemispheres. So, we were growing these crops for the Canadian and

	European cereal breeders and they would come down here and select some of the lines that they felt had the best disease resistance with probably the best yield, those sorts of qualities. The whole idea of it was to get two production seasons or two growing seasons in order to speed up the whole breeding process for those lines that they were looking to develop. That's my foray into science. I've just turned over 20 years doing science on this crop and foods working in the plant and food space. I've been around for a little while.
He wahine tenei mai Asia. Team Leader food innovation Palmerston North	I have been in New Zealand for two years. I'm a food technologist. I am originally from the Philippines but I studied in the UK.. My background is in food manufacturing but specifically around product development. My role here is that I manage the Food Innovation team. I guess the skills I have brought with me are pretty much around people management, so the bulk of my career started to head towards management. What we do in the Food Innovation space is we look after food and drink projects that come through from industry, and whether that's start-ups or multi-national; we support any of the projects that come that way rather than academic research if you like. So that's probably the biggest difference. We are a team of technologists with diverse backgrounds. A small team really, only about six people; so we have a whole range of sizes of projects, with differing complexities. But we haven't been involved in genomic research or the commercialisation of it.
He Tane Pākehā tenei mai Palmerston North. Commercialisation manager.	Currently I am the Commercialisation manager and prior to my present position I spent 25 years working in the NZ dairy industry in a range of research and development roles ranging from research scientist through to R&D management. I have very little knowledge of genomics or gene editing or turbo breeding. I do have a strong interest in the commercialisation of research in the food and agritech space but in the main our focus has been on commercialisation of IP.
He Tane Pākehā tenei no America. Council Chair Palmerston North	As with everybody else people need to eat so when I went to college similar to Universities here in NZ. I had a whole range of different jobs and wasn't too fussy about what I did to earn money to get me through my studies. I did science and technology and generally it led me to quantitative genetics and agricultural research and breeding type studies with animals mainly cattle. Then genetic sequencing machines became available and so my work has a lot to do with this type of work and I am very familiar with genomic research, gene editing, genetic modification. I am more well known for a paper I wrote and published around a series of genetic mapping of populations – in a neuro-science journal. I was the very first director of the Illinois Genetic Marker Centre at the University of Illinois providing cost effective access to molecular marker technology to the agriculture research communities The thing about this type of research is to just take what you need from it to do what you need rather than manipulating data and forcing things to happen. I have also not gained commercially from research I have done for people – my own IP I own and will commercialise that but if it belongs elsewhere then it belongs to them I am not about taking other peoples stuff for my own gain but I am happy to help people get their ideas and resources to where they want them. I did a lot work on DNA sequencing which is great that is about turning things into other interesting thing to find something that will eventually work. I

	worked on a project that was publicly funded through Cornell University – I got no personal gain from it but there was some commercialisation involved from the university end and some public benefit and gain from it as well. Came to New Zealand and met my wife who is from Northland – Kaeao My current organisation provides geno-typing by sequencing services.
He Tane Māori tenei. Business owner. Wellington	Kia ora, so I am a lawyer, business person; director, from Taranaki, Whanganui and the last 10 years I've been working closely with Māori in the Māori economic development space, and as a director, advisor, investor. In these latter roles I've started to see some interesting things relevant to this space. We looked at research with AG Research, Landcare and other private institutions; looking in the AG tech space, so that was quite interesting. In the AG tech space, they use the phrase taxonomies, or sectors, often there are genetic research programmes. So, things like how to make a bigger, faster, more bionic dairy cow for example, and then they have other types of sectors like different food supplements and different environments that the animals are often in. Basically farming is just a big biological system, so I got close to that. We studied as part of the boot camp programme of iwi governors that went to Stanford six years ago, and we looked at a whole lot of technology businesses in America, and interestingly we could see some collaborations to work on Māori assets basically; fishing, farming, forestry etc. In the last five years wearing my personal business we have invested directly in start-up technology and innovation businesses. I'm on the New Zealand advisory committee of an international business and last month took a couple of iwi representatives up to Chicago and San Francisco to look at all of the bio-tech companies that we could potentially bring back to New Zealand. One business in particular is focused on laboratory grown meat, synthetic cell-based meat, I have seen it, tasted it firsthand.
He Tane Māori tenei. Business owner /Director WELLINGTON	I'm from Ngāti Maniapoto, I live in Kāpiti now; had a bit of a windy road to get to what I'm doing now. I started off as a tradesman then went into engineering. I did my MBA at Massey as an adult. I have four children. After the MBA I went to Deloitte in Wellington and was managing the strategy team out of Wellington for a couple of years. And then got offered another role there which would have kept me there forever and I turned that down and went and started my own company because I wanted to work in the Māori and iwi economic development space. So I set up a company and later merged with another firm. We had lawyers and consultants working with iwi and Māori across the country and government on all sorts of projects including economic development, health, education related stuff; policy and strategy and advisory for 13 years. During that time I was pulling government data to try and get a better handle on what the opportunities were for whānau, for iwi and Māori, realising that the government data wasn't being put to good use around policy. The issue for me was, they have all this dated information on us; they know so much about us, why are the policies and programmes so crappy? So, I had a guy build a data platform for me so we could make better sense of all of that data about whānau and about ourselves and what the future could look like; and I've been doing that now for… been running the data platform company now for coming up to five years. More recently most of our work is

	focused in on the environmental, freshwater quality, land use, land practice space; and then in the iwi demographic, health, education space so there's two big chunks of domains that we work in with the data stuff.
He Tane tenei mai Timaru. An inventor and scientist.	I grew up in Timaru. My first 18 years I lived in a state house with my parents and we lived quite poor - off raro and two-minute noodles, so yeah quite a hard upbringing. I am obviously of Ngāi Tahu descent through my father. I can go six generations back and registered as a Ngāi Tahu. I think today I have developed four inventions as an entrepreneur - my first invention I sold for $1mil for the rest I have sold to other companies as well for an undisclosed amount plus I also receive royalties from my last three inventions. I have been developing my own companies, which I have also sold on. I could go into all of them, but it would take ages. Now I am the Director of Technology and Innovation at this New Zealand company. I run the Research and Development portfolio worth 24 million and I have 10 employees. We are pretty much creating more value for our product. We just got voted the best company in New Zealand through the New Zealand Trade & Enterprise Supreme Award so really exciting.
He Tane Māori tenei mai San Diego	I run a venture capital firm here in California. I'm one of the founders. We manage $450mil NZ that we are investing across start-up companies, primarily in the ag and food sector. Originally, my whānau we whakapapa back, primarily into Waikato and Taranaki, so Ngāti Tipa, Taranaki and also actually Te Aupouri up North through my koro's side of the whānau. I grew up mainly in the Waikato though; we have a dairy farm there and also other agricultural land. My professional background is primarily in finance and agronomics, but in the last 15 years I have investing in technology companies in the ag and food sector. How I came to be in the US; I was regional director of NZ Trade Enterprise for the Americans, so North and South America, running the trade mission. Then earlier in my career I was in the banking sector at Westpac and I was also involved in setting up Parininihi ki Waitotara's farming company as well too. So, I spent more than 10 years working on the development of, going from essentially being a landlord with a West Coast settlement reserve process and then into actively managing their farming footprint today. Yeah, we put them in the top 10, I think probably corporate farms in the dairy farming space in New Zealand, which of course now has its own set of problems that relate particularly to climate impact and obviously significant challenges in front of that industry, which hopefully the technology areas we're investing in, could potentially be part of that solution. In some respects, I've sort of come full circle, going from an agricultural land management to being a silicone valley technology investor. So, in relation to, I think your topics of interest; we do actively invest in life science and biology-based technology companies in our current portfolio we've got seven companies that are using bio-technologies across plant systems, microbes and most recently we're doing work also in livestock. Our other company has a technology that they developed at ag research grasslands campus in Palmerston North and it has had about 10 years of

	investment. It's a synthetic biology platform technology that is focused primarily on improving oil seed production in oil seed crops; started off in grasses, actually looking to make a high energy grass for dairy grazing by increasing the lipid content in the entire plant. But that company is at a point where we are in the fourth year of advanced field trials here in the US with soybeans and canola. We've just started a research programme with hemp focusing on increasing CBD production. We have numerous similar investments both here and in NZ.
He wahine toa tenei mai Wellington. Patent Attorney	He uri ahau nō Aotea waka; ko Ngāti Ruanui, Ngā Ruahine, Ngā Rauru ngā iwi. I was born and raised in Wellington; I grew up in Porirua. Went to school in Porirua, and then Victoria University. My father was a patent attorney - or he was originally a chemist - and then became a patent attorney later in life. While I was at University I worked or this company part-time doing all the odd jobs around the office, in-between lectures and tutorials. That sort of became like a permanent, and I just kind of moved up the organisation and started doing junior training, para legal work. I really enjoyed doing the work I was doing in intellectual property field. Since then I have worked in the trademarks team helping organisations protect and enforce and exploit their trademarks. I currently manage our incoming work from Asia, the West Coast of the US, Canada, South America and Africa. I also manage our practice in the Pacific Islands. When I started my career, the Wai 262 claim was filed in 1991, so that became something I was interested in. The Wai 262 claim was well underway and being worked on. I became a sort of a observer from the sidelines and, also, a translator for the attorneys working in the patent attorney profession because they just didn't understand these concepts that Māori were talking about, or that indigenous people were talking about not just in New Zealand but also overseas. I sort of became that conduit or translator. But I wrote a number of articles on the area and sort of have been following from the side ever since. And then also advising our clients on this culture between traditional knowledge and the intellectual property system in general. And that is sort of where it has led me to provide advice on genomic research, in particular the rights of indigenous peoples and the view that indigenous people's take of research in this area or in that area including in gene editing. That's sort of it in about five minutes.
He tane Māori tenei. Relationships manager and liaison	I hail from primarily Ngāti Māmoe, Ngāti Wairangi, and Taranaki lines. I'm from Kaiapoi just south of Christchurch. I've got a strong background in environmental management and policy analysis and a long career in translating different sciences into communities through my environmental management work. I've been able to interpret sciences, biology, ecology and geology and engineering and all sorts of stuff back to communities and do bridging work between them as well as environmental planning. Those were some of the fundamental skills needed with this current role. I've also got a strong whānau history in terms of mātauranga Māori, so having grown up in a world that is pretty well founded in te ao Māori, that has been a foundation for me in relation to how my career has led nicely into genomics. Of course, I have found this to be one of the greatest challenges because it is such a technical field and bringing that into community is challenging. But one of the core foundations of my whānau is whakapapa Māori, so for me, it has been handy to be able to simply take a whakapapa lens to this science and try

	and translate its various elements to kaupapa Māori or te ao Māori lens when I'm speaking to Māori communities. So, that technical nature of it can be resolved by simplifying it and bringing it into a Māori context in terms of the language, in terms of views. And vice versa too, of course, because we interact with a lot of institutions and researchers. That is a little bit about my background and the way I slotted into this world which I find to be fascinating. I need to add too that for the past eight years really, maybe a bit longer now, I've been involved in Māori economic development and worked in that field for The Rūnanga. Being able to bring this broad skill set to the science has been quite neat. I'm just completing a masters soon and that field will be in economics focusing on Māori resource economics. That's applicable too to this interview and the science, where we are going with that as Māori and the discussion between Crown and understanding the difference between IP and what they think is IP and what we would call mātauranga Māori. Those holistic views as opposed to the very narrow ones. That is sort of the breadth of me in a nutshell in relation to my work.
He tane Pākehā tenei mai South Africa. Commercialisation Manager WELLINGTON	I am originally from South Africa, trained as a clinician. I worked as a GP, I've worked in the UK and South Africa. Coming to New Zealand, I worked at an organisation that regulates drugs. That same organisation will become the Cannabis and medical devices and health systems regulator in the near future. I then worked in the pharmaceutical industry, and after that, was consulting on commercialising health technology. And that's really where most of my view on genomics and similar research was formed. I'm now at my current employment but this role does not participate or have a role in the genomics debate and so hence I'm in the interview in my personal capacity. We occasionally have interactions with people who have an opinion in genomics, but that's not really a focus of our research institutes; our focus is advice, materials, and occasionally if you link the advice materials of an organism to the genome, then you can derive useful information. But that's not actively being done at the moment, so that's more a future opportunity. My interest is from clinical medical and health perspective – there are benefits to genomic research but there are also negative aspects as well.
He tane Māori tenei mai Auckland	Nō Ngāti Whātua ahau. E noho ana au ki Tamaki kei waenganui i te whānau i runga i te papakāinga o Ōrākei. I am in a new role, so started in this role this year. Ētahi o aku mahi ki te taha o te iwi; I'm current chair of our Kāhui Rangahau overseeing our research strategies for Ngāti Whātua o Ōrākei. I perform also with Hatea kapahaka as well. That sort of covers most things I think; oh, got a bunch of kids. I have a science background and liaise with staff and link them or connect them with Māori – a relationship broker.
He wahine toa tenei mai Rangiora Law and nutrition	I have a PhD in Nutritional Biochemistry from the University of Sydney. She has a background in Law and is a New Zealand Registered Dietitian. I have my own business. My background is both in law and in nutrition science, and my business brings those two strands together and looks at translating them for practical application for government, industry and research organisations. I've got a number of roles through my business; some of them overlap, some of them are separate, probably relevant for today. I'm the Vision Mātauranga Programme Leader for High Value Nutrition National Science Challenge. I've worked with a number of Māori organisations in the food space, so one group that I'm working with I am helping them with their Indigenous Organisms

	Programme but also looking at how we can map a pathway for high value product development involving particular ingredients. I was the Project Manager for a cluster organisation of Māori food and beverage entities that came together to develop a high value food solution for pre-diabetes for export to Asia. I'm also connected into other core research centres and a CRI, so those are probably the roles at the moment that might be relevant.

Te Manu Tāiko
Human Research Ethics Committee
Te Pua Wānanga ki te Ao
Faculty of Māori and Indigenous Studies
& Te Kotahi Research Institute

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RESEARCH INFORMATION SHEET

TE NOHONGA KAITIAKI: GUIDELINES FOR GENOMIC RESEARCH WITH TAONGA SPECIES AND RĀKEIA TE MOMO: EXPLORING THE CO-INNOVATION INTERFACE

11 November 2019

Tēnā koe, my name is Dr Jason Paul Mika. I am a senior lecturer at Massey University's School of Management in Palmerston North and co-director of Te Au Rangahau, the Māori Business & Leadership Research Centre. I am a researcher on two research projects—Te Nohonga Kaitiaki and Rākeia te Momo—both of which explore Māori perspectives on genomic research.

Te Nohonga Kaitiaki is a Genomics Aotearoa funded research project that aims to develop culturally informed guidelines for genomic research with taonga species. The project team comprises Maui Hudson, Phil Wilcox, Jacinta Ruru, Jason Mika, Matt Stott, Bobby Brooks and Chris Battersill. **Rākeia te Momo** is part of a project led by Plant & Food Research called 'Turbocharging Plant Production,' which aims to accelerate plant breeding using gene-editing technologies. As part of these projects, we are interviewing key informants—Māori and non-Māori—about the process of commercialising genomic research and Māori participation in this. Members of this research project are Maui Hudson, Sandy Morrison, Nick Roskruge, Phil Wilcox, David Chagne, and Aroha Mead. Both projects have been approved by Waikato University's Human Research Ethics Committee.

We invite you to share your views in a confidential interview with our team. Te Au Rangahau research associates Dr Annemarie Gillies and Ngarangi Chapman will be approaching potential participants for an interview. Interviews may take up to 60 minutes and are preferably conducted in person, or online via video conferencing (Zoom or Skype) and/or by phone at your convenience.

We would like to record the interview on audio tape in order to develop clear and full transcripts of the interview. You have the right among other things to:

- refuse to answer any particular question.
- ask any further questions about the study that occurs to you during your participation.
- withdraw your material and participation at any time.
- change and comment on the summary transcript of your interview.
- be given access to a summary of the findings from the study, when it is concluded.

Thank you very much for your time and help in making this research possible. If you have any queries or wish to know more please email me at j.p.mika@massey.ac.nz or phone 06 951 9361. For any ethical concerns please the project leader: Associate Professor Maui Hudson, Te Pua Wānanga ki te Ao, email: maui.hudson@waikato.ac.nz, phone: 027 206 1183.

Appendix 3 Consent Form

Te Manu Tāiko
Human Research Ethics Committee
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THE UNIVERSITY OF WAIKATO
Te Whare Wānanga o Waikato

CONSENT FORM

Te Nohonga Kaitiaki: Guidelines for Genomic Research with Taonga Species and Rākeia te Momo: Exploring the Co-Innovation Interface

Research Participant

1. I have read the 'Information Sheet' and have had details of the study explained to me.
2. My questions about the study have been answered to my satisfaction, and I understand that I may ask further questions at any time.
3. I also understand that I am free to withdraw from the study at any time, or to decline to answer any question in the study.
4. I wish to participate in this study under the conditions set out in the Information Sheet.
5. I would like copies of my information returned to me: **yes / no**
6. I **consent / do not consent** to be named as a participant in this project
7. I **consent / do not consent** for specific quotes to be attributed to me.
8. I **consent / do not consent** for the information collected for the purposes of this research study to be used for any other research purposes.

Participant's name: _____

Participant's signature: _____

Date: / /

Contact details: _____

_____

Researcher's name:

Researcher's signature: _____

Interview Schedule

MĀORI PARTICIPATION IN GENOMIC RESEARCH AND ITS COMMERCIALISATION

7 November 2019

Mihimihi / Whakawhanaungatanga

About the participant

1. Please tell me about a little about where you were born and raised and how you came to be in the role you are in now?
    a. Ko wai koe?
    b. No hea koe?
    c. He aha to mahi?

Working with Māori organisations

2. Describe your experience and association with Māori organisations and enterprises?

Genomic research

3. Describe your role/s and experience in genomic research or related research?

4. In what ways do think Māori rights and interests are affected by genomic research?

Commercialisation

5. What is your understanding and experience of the commercialisation of genomic research?

6. What views do you have about access and benefit sharing with Indigenous people?

Māori participation

7. Why might Māori wish to participate in the commercialisation of genomic research?

8. In what ways are Māori participating in genomic research and its commercialisation?

9. What are some of the barriers to Māori participation in genomic research and its commercialisation?

10. What do you consider are some of the enablers for Māori participation in genomic research and its commercialisation?

11. Can you please describe any examples of Māori involvement in the commercialisation of genomic research, or commercialisation of other kinds of research?

12. How would describe Māori experiences of commercialisation of research?

13. What improvements if any could be made to support Māori participation in the commercialisation of genomic or other kinds of research?