

Genetic Technologies and OUR ENVIRONMENT



National Conversations on Genetic Technologies for Environmental Purposes: Executive Summary

Using Deliberative Processes To Gather
Perspectives From Across Aotearoa

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National
SCIENCE
Challenges

NEW ZEALAND'S
BIOLOGICAL
HERITAGE

Ngā Koiora
Tuku Iho

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Executive Summary

Background

This report outlines research findings into New Zealanders' perceptions of genetic technologies for environmental and / or conservation purposes. The work was funded by the Biological National Science Challenge, based on the awareness that *'before we adopt any new technology we must ensure it is suitable for our lands, our native species and our people'*.

To better understand what 'suitable' means to the public of Aotearoa New Zealand, we have engaged people in dialogic and deliberative processes to enable them to deliberate and design in groups what environmental futures might look like for specific genetic technologies in specific contexts.

This research was conducted in two streams, one focussing on engagement with the general public and the other focussing on engagement with Māori to elicit specific aspirations and concerns about gene technology in a way that they self-determine. The public engagement was undertaken by social scientists at the University of Auckland and the University of Otago.

Māori engagement was undertaken by researchers at Te Tira Whakamātaki (TTW). Māori participation in modern biosecurity follows a pattern similar to other Indigenous efforts at asserting Indigenous environmental approaches. These efforts are constrained by colonial histories and ongoing systemic marginalisation, with rare moments to pursue self-determination but occasional opportunities to engage and inform wider strategies.

Methods

Engagement with the general public included three phases: Explore, Refine, Deliberate. A total of 376 participants engaged in 38 engagement events (workshops), 43 deliberative focus groups who deliberated on a total of 69 scenarios.

In the first phase, a wide range of New Zealanders were engaged in discussions about their visions for environmental futures and to consider the use of genetic technologies.

In the second phase a broad range of stakeholders were engaged to understand the technical feasibility of genetic interventions, determine a set of environmental scenarios where genetic technologies are seen to have a potential role, and to explore the range of concerns these scenarios might raise.

In the third phase, the public were again engaged, this time in small group deliberations addressing four specific environmental scenarios: myrtle rust, wilding pines, rats and varroa mite, using RNAi (myrtle rust; varroa mite), gene editing (wilding pines) and gene drive (rats). Each group was asked to reach a consensus decision on the tools they wanted to see in New Zealand's environmental management toolbox, and what cautions or guidelines they wanted considered around the use of management tools.

TTW used two methods to gauge Māori attitudes to, and beliefs on, genetic technologies. They undertook a national survey and received 537 responses, with 26% who self-identified as Māori and 74% as Pākehā. They assessed people's

- support for using genetic tools in pest control and environmental protection;
- comfort with various genetic technology tools;
- trusted information sources.

TTW complemented the survey with group discussions to explore the attitudes, motivations, and cultural nuances underpinning comfort and discomfort to genetic tools in biosecurity. Participants included Māori researchers and academics, community members and kaumatua active in biosecurity. Five scenarios were presented that were specific and of relevance to their communities. These were: De-extinction: Bringing back the Huia; Genome Editing: Mānuka and Pōhutakawa Resistance to Myrtle Rust; Sterile Insect Technique: Fruit Fly Invasion; Transgenics: Kūmara Resistance to Insects and Gene Drive using CRISPR: Possum Infertility.

Key Findings

General Public Stream Phase 1

- Environmental visions are a key framework in which hopes and desires help to determine a sense of problems and opportunities. For many New Zealanders, the potential role of genetic technology is largely imagined through predator control, including the aspirational Predator Free 2050 project. People have a wide range of perspectives, reflecting hopes and concerns for technology, environment, society, economy, cultural values and beyond.
- Who should sit around the decision making table? Trust in science remains high, while trust in industry is lower.
- While the questions around genetic technologies for the environment are not top-of-mind for many New Zealanders, there is a desire for more information and, importantly, for more conversation. This needs to be accomplished in ways that hear and acknowledge multiple views and visions as legitimate, even if people feel a sense that, because they don't know enough about genetic technologies, they lack epistemic legitimacy to speak.
- Fundamentally, New Zealanders saw the possible introduction of gene technology into the environmental management architecture to be less about the technologies themselves, and more about the social, economic and environmental factors.

General Public Stream Phase 2

- Science and innovation is often presented to the public in relation to radical and/or futuristic ideas. For quality public engagement, it is necessary to present feasible science, connected to actual problems and genuinely targeted and reachable solutions.
- The variety and specificity of the technology is often quite distinct from the way gene technology is imagined in the public sphere. Specifically, gene silencing (RNAi) is a front runner in terms of potentially applicable technology.

General Public Stream Phase 3

- People can deliberate with a deep and nuanced consideration when supported with appropriate and contextualised information about environmental scenarios and potential technologies.
- Decisions about the inclusion of genetic technologies in the environmental management toolbox are accompanied by a wide range of cautions, not only for ecological impacts, but also for social, cultural and economic impacts. People wish to see high levels of regulation and oversight of these technologies, both New Zealand wide and internationally, if they were to be used.
- While trust in science is generally high, people wish to see more research done, particularly in contained environments. Trust in industry tends to be much lower, with suspicion levelled in particular at the idea of profit making from genetic technologies, while costs to industry and to exports were also of concern.
- Not everyone accepts environmental problems as presented, and even if they do this does not imply an acceptance of new technologies as solutions. If problems are seen as urgent this raises the acceptance of the possible use of genetic technologies, but not universally.
- Potential support for the introduction of a technology is not determined by the technology itself. Non-technical factors, from commercial interests to whether the intended target is flora or fauna hold more sway over such positions.
- The link to commercial interests is viewed as a concern when it is perceived as potentially biasing, but viewed as a positive when potentially holding industry to account.

General Public Stream Deliberations on the Specific Environmental Issues

This research used a deliberative process with public groups to hear their views on whether and how genetic technologies should be used for four specific environmental scenarios, and what cautions they would want to see in place.

Summary of Public Deliberation on RNAi for Myrtle Rust

- Almost half of the public groups decisively supported the inclusion of RNAi as a genetic technology in the environmental toolbox for myrtle rust, largely as a replacement for fungicides. However, all groups recommended a cautious approach with regulatory control, careful implementation and more and

continued research needed to monitor and address ecological and off-target impacts and issues of ownership.

Summary of Public Deliberations on Gene Editing for Wilding Pines

- Some groups expressed strong support for the inclusion of the technology in the environmental management toolbox, or for more research into its possible use. But this was tempered by concerns about the potential ecological impacts of genetic engineered pines and a questioning of the problem definition itself (are wilding pines a problem or an opportunity).

Summary of Public Deliberations on RNAi for Varroa Mite

- In contrast to the other scenarios, the broader commercial and economic context and human health were considered alongside the ecological impacts in group's decision-making of the varroa mite scenario. While RNAi technology was seen to offer benefits over current tools for myrtle rust and perceived to carry fewer risks, this was not seen to the same extent with varroa mite, with groups largely offering only tentative and conditional support for the implementation of gene technology to manage this biosecurity issue. However, RNAi technologies were considered preferable to genetic modification.

Summary of Public Deliberations on Gene Drive for Rats

- While groups agreed that rats were a significant pest in New Zealand and supported a predator free vision, they overwhelmingly called for a very cautious approach to any consideration of gene drive for rat eradication or control. Much of the precautionary approach was driven by the high level of unknowns surrounding the technology. A sense that the current tool box was insufficient or ineffective at meeting predator free visions and the perceived animal welfare advantages that gene technology might offer were set against the considerable environmental, technological, regulatory, governance and legal and ethical challenges of the technology.

Special Interest Group

- Two special interest groups were approached to deliberate on the scenarios. The group drawing on GE Free and organics communities across the country expressed deep concern and suspicion about the implementation of gene technologies. This was based on significant concerns over the control and

management of the technology. However, there was some variability within these interest groups over the application of gene technologies in specific situations, in particular if genetic technologies reduce the use of toxins in the environment. The group drawn from students in an undergraduate at university course saw considerable potential for the application of gene technologies for environmental purposes and the need for more and continued research to into these technologies, however, they also sought a very cautious approach with regulatory control, careful implementation and research needed to monitor and address ecological and off-target impacts.

The analysis of conversations and the 10 insights provided in the report's synthesis chapter, provides a rich understanding of people's nuanced and careful decision-making, considerations and cautions. These may assist decision-makers to more deeply understand what **safe** and **responsible** innovation may mean to New Zealanders, as they contemplate the potential of genetic technologies in the natural environment.

Māori Stream Survey and Scenario Insights

Reflecting on the survey's key insights emerged:

- Discomfort was primarily driven by the unknowns of genetic tools and technologies
- whakapapa and its implication forms the backbone of any discussion about genetic technologies
- Education, training and information sharing could influence people's comfort levels.

The group scenario discussions revealed consistent perspectives where participants emphasised the importance of thinking about whakapapa (in various forms), fully understanding broader ecological impacts, and strictly following tikanga processes set forth by community for any genetic technology proposal (regardless of which tool). Even for those who showed cautious openness to the use of genetic technologies under specific, well-regulated conditions, significant concerns remain about the unknown consequences and ethical implications, including on whakapapa.

While TTW's results offer valuable insights, they should not be generalised to all Māori across Aotearoa but rather should serve as a starting point for further discussions and community consultations.