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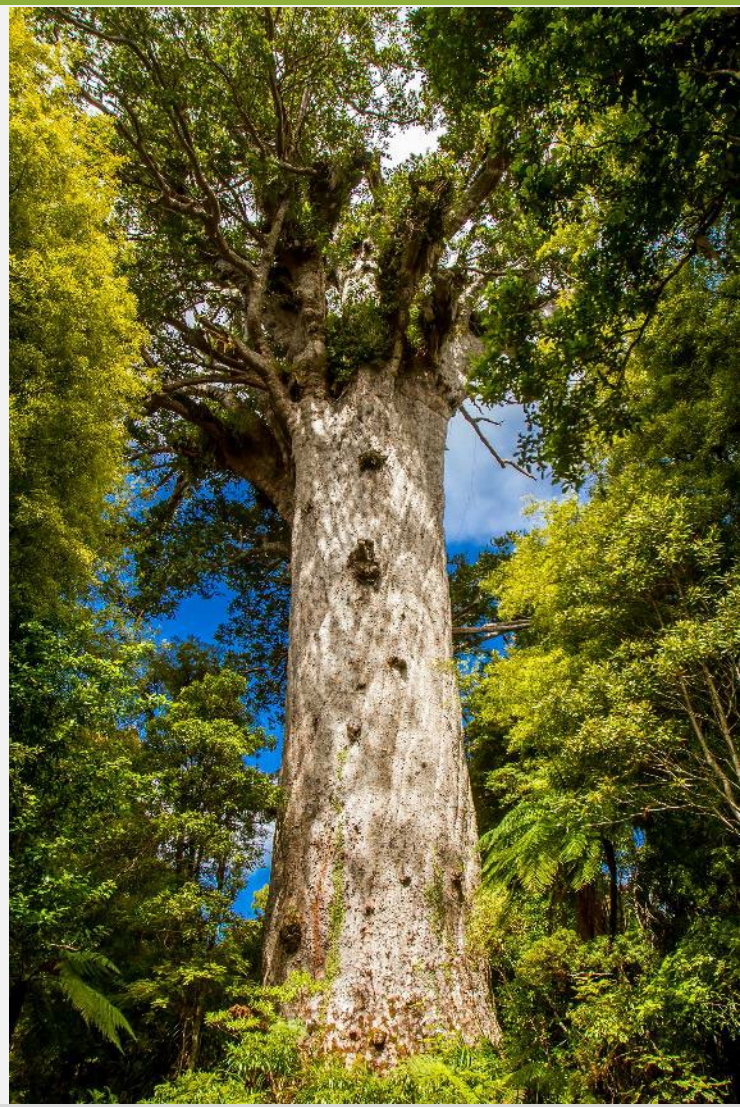
A look at New Zealanders' current opinions and understanding of genetic technologies



Key Research Questions

How **aware** are New Zealanders of genetic technologies?

How **informed** do New Zealanders feel they are about genetic technologies?

How **accepting** are New Zealanders of the use of genetic technologies?

METHODOLOGY

WHAT: 10 minute online survey using the Colmar Brunton Fly Buys panel.

WHEN: 12th July to 7th August 2019
(Additional fieldwork completed 25th October to 4th November 2019)

WHO: 4042* New Zealanders aged 18-69 years old.

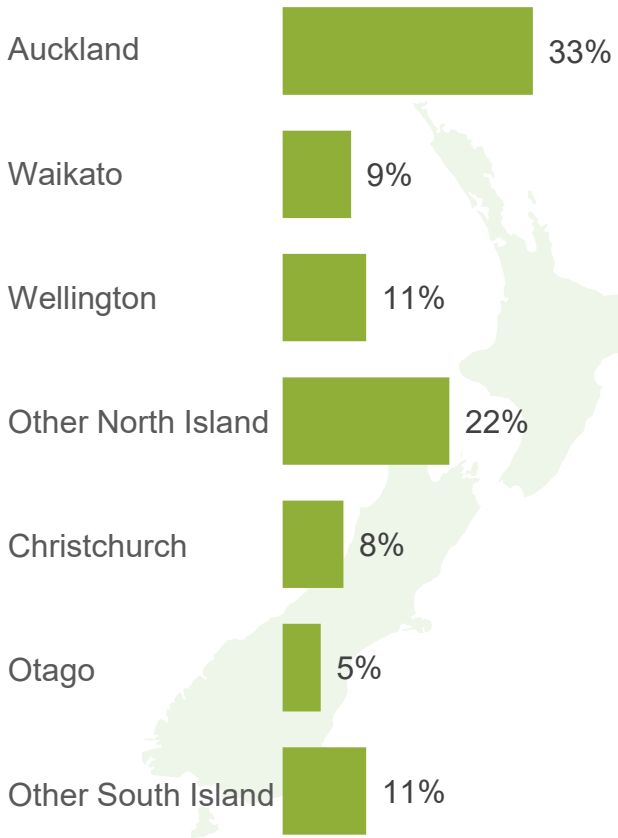
* Design effect = 1.17
The maximum margin of error for a sample size of 4042, inflated by a design effect of 1.17 is +/- 1.8% at the 95% confidence level.

Sample Profile

Ethnicity

New Zealanders	84%
New Zealander of European descent / Pakeha	70%
New Zealander of Maori descent	19%
New Zealander of Pacific Island descent	2%
New Zealander of other descent	2%
Pacific Islanders	1%
Asian	9%
Other ethnicity	10%

Region

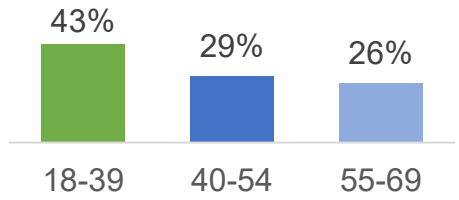


Gender

NZ Residency

All NZ citizens / residents

Age



Income

Less than $50k	31%
$50-$100k	34%
$100k plus	30%

Type of area lived in

Urban	27%
Suburban	49%
Rural	24%

Education

High School level education	56%
University educated	25%
Other*	19%

Q1. Age Q2. Gender Q3. NZ Residency Q4. Region Q5. Type of area lived in Q6. Education Q7. Income Q8. Ethnicity
Base: Total sample (n=4042) Data is post weighted for age, gender, region, income and education to be nationally representative

*Other types of education mentioned include trade qualifications and other non-university higher education

Awareness of genetic technologies

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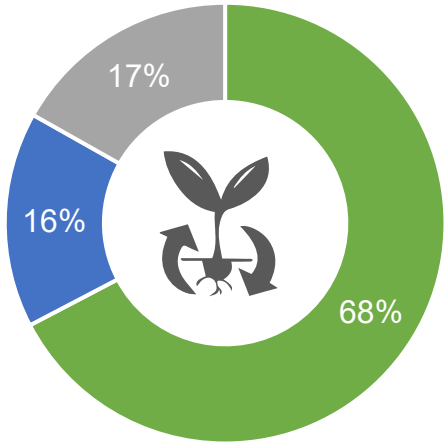
Three quarters of the population are aware of at least one type of genetic technology with genetic modification being the most heard of.

AWARENESS OF GENETIC TECHNOLOGIES

Overall aware	Aware of none
74%	26%

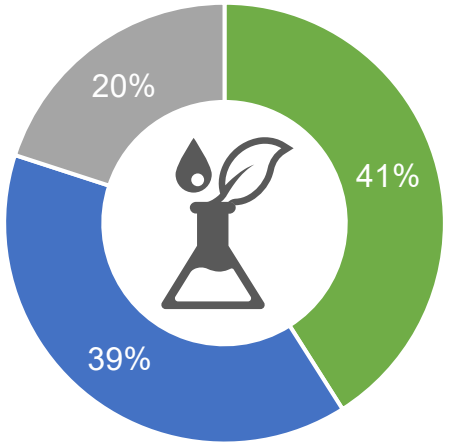
Yes No Don't know

Genetic modification / transgenic technology



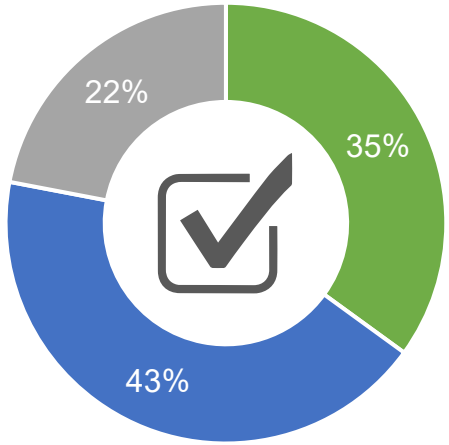
Awareness of Genetic modification significantly higher than all other genetic technologies

Gene editing (such as CRISPR-Cas9)



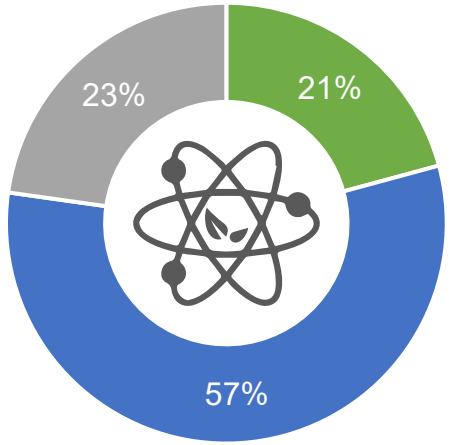
Awareness of Gene editing modification significantly higher Genomic selection and Marker-aided selection

Genomic selection



Awareness of Genomic selection significantly higher than Marker-aided selection

Marker-aided selection



Awareness of Marker-aided selection significantly lower than all other genetic technologies

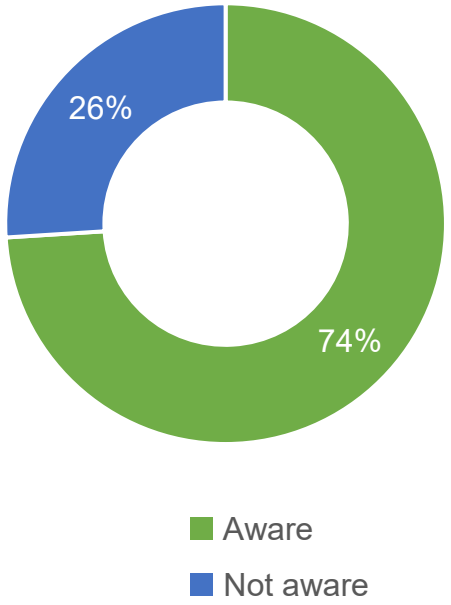
Q9. Which, if any, of these genetic technologies are you aware of?
Base: Total sample (n=4042)

Xx/Xx Significantly higher lower than total

Those who are most likely to be aware of genetic technologies are males, 55-69 year olds, identify as NZ European, living in rural areas, university educated and earning a higher income, whilst people unaware are more likely to be female, 18-39 years old, living in an urban area, on a lower income and identify as Maori or Pacific Islander.

PROFILES OF AWARE AND UNAWARE OF GENETIC TECHNOLOGIES

Overall unawareness significantly higher among:
Females (**29%**)
18-39 year olds (**30%**)
Live in North Island excl. Auckland, Waikato and Wellington (**29%**)
Urban dwellers (**32%**)
High School educated (**32%**)
Earning an income of less than $100k (**29%**)
Maori (**31%**)
Pacific Islanders (**47%**)



Overall awareness significantly higher among:
Males (**76%**)
55-69 year olds (**79%**)
Rural dwellers (**77%**)
NZ European (**76%**)
University educated (**83%**)
Earning an income of $100k or over (**81%**)

Base: Total sample (n=4042), Aware (n=3041), Not Aware (n=1001)

Significant differences in awareness of genetic modification / transgenic technology

AWARENESS OF GENETIC MODIFICATION / TRANSGENIC TECHNOLOGIES PROFILE

Don't know significantly higher among:
Other North Island (19%)
Living in an urban area (20%)
High School Educated (19%)
Earning an income of less than $50k (22%)
New Zealanders of Maori descent (20%)
New Zealanders of Pacific descent (30%)
Indian / Pakistani / Sri Lankan (26%)

No significantly higher among:
18-39 years old **(21%)**
Christchurch **(23%)**
Living in an urban area **(19%)**
High School Educated **(19%)**
Pacific Islanders **(40%)**

Yes significantly higher among:
55-69 years old (**75%**)
Living in a rural area (**73%**)
University Education – Undergrad (**76%**)
University Education – Postgrad (**80%**)
Earning an income of $100k or over (**75%**)
NZ European (**71%**)
Chinese (**77%**)
New Zealanders (**69%**)

Q9. Which, if any, of these genetic technologies are you aware of?
Base: Total sample (n=4042)

Significant differences in awareness of gene editing

AWARENESS OF GENE EDITING

Don't know significantly higher among:
Female (**21%**)
55-69 year olds (**24%**)
Other North Island (**23%**)
Living in an urban area (**22%**)
Earning an income of less than $50k (**26%**)
New Zealanders of Maori descent (**25%**)
New Zealanders of Pacific Island descent (**34%**)
Pacific Islander (**34%**)

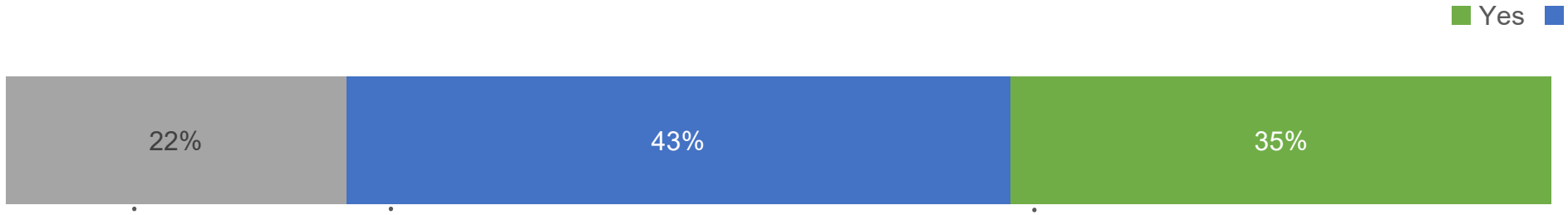
No significantly higher among:
Female **(42%)**
18-39 year olds **(42%)**
High School Educated **(42%)**

Yes significantly higher among:
Males (**46%**)
University Education – Undergrad (**50%**)
University Education – Postgrad (**62%**)
Earning an income of $100k or over (**46%**)
New Zealanders of European descent / Pakeha (**43%**)

Q9. Which, if any, of these genetic technologies are you aware of?
Base: Total sample (n=4042)

Significant differences in awareness of genomic selection

AWARENESS OF GENOMIC SELECTION



Don't know significantly higher among:
55-69 year olds (**26%**)
Other North Island (**26%**)
High School Educated (**24%**)
Earning an income of less than $50k (**28%**)
New Zealanders of Maori descent (**26%**)

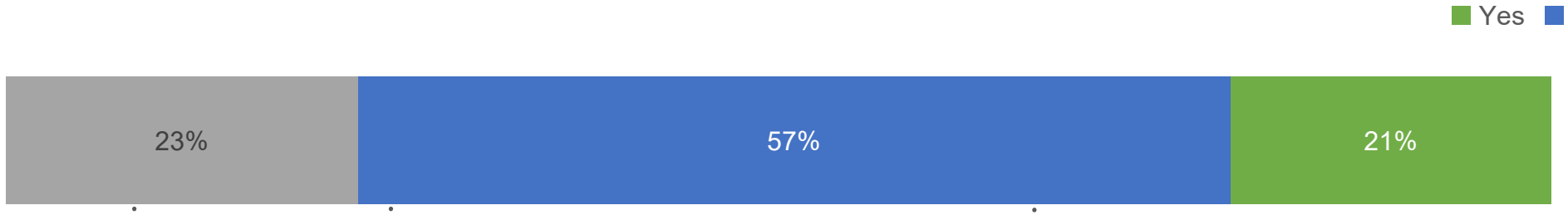
No significantly higher among:
High School Educated **(48%)**

Yes significantly higher among:
Males (**37%**)
University Education – Undergrad (**45%**)
University Education – Postgrad (**62%**)
Earning an income of $100k or over (**41%**)
New Zealanders of European descent / Pakeha (**37%**)
Other ethnicity (**46%**)

Q9. Which, if any, of these genetic technologies are you aware of?
Base: Total sample (n=4042)

Significant differences in awareness of marker-aided selection

AWARENESS OF MARKER-AIDED SELECTION



Don't know significantly higher among:
55-69 year olds (**28%**)
Other North Island (**26%**)
High School Educated (**25%**)
Earning an income of less than $50k (**28%**)
New Zealanders of Maori descent (**28%**)

No significantly higher among:
Female **(58%)**
18-39 years old **(59%)**
University Education – Undergrad (**59%**)
Earning an income of $100k or over (**61%**)
New Zealanders of European descent / Pakeha (**58%**)

Yes significantly higher among:
Males (**24%**)
University Education – Undergrad (**25%**)
University Education – Postgrad (**36%**)
Earning an income of $100k or over (**23%**)
Chinese (**30%**)

Q9. Which, if any, of these genetic technologies are you aware of?
Base: Total sample (n=4042)

Understanding of genetic technologies

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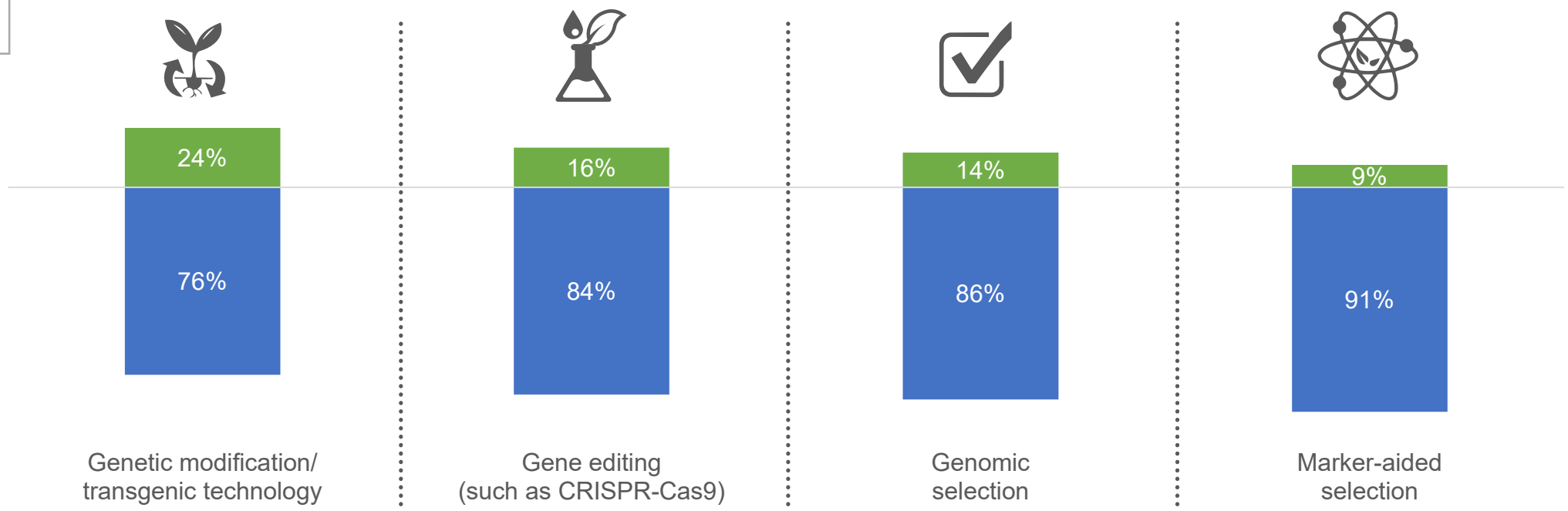
Although the majority of the population is aware, this does not translate to knowledge, with less than a third of the population overall saying they feel informed about some type of genetic technology and only a third of those who are actually aware of each technology feeling informed.

How informed are New Zealanders about genetic technologies?

Overall Informed
28%

Not informed about any
72%



% who feel informed amongst those aware

Genetic modification/ transgenic technology	Gene editing (such as CRISPR-Cas9)	Genomic selection	Marker-aided selection
32%	34%	34%	36%
n=2803	n=1741	n=1505	n=888
Significantly lower than Marker-aided selection			Significantly higher than Genetic modification

Q10. How informed do you believe you are at present about these genetic technologies?
Base: Total sample (n=4042)

Significant differences in feeling informed about genetic modification / transgenic technology

FEELING INFORMED ABOUT GENETIC MODIFICATION / TRANSGENIC TECHNOLOGIES PROFILE – AMONGST THOSE AWARE

No significantly higher among:
Females **(74%)**
40-54 years old **(71%)**
Other South Island **(78%)**
High School Educated **(72%)**
New Zealanders of European descent / Pakeha **(71%)**
New Zealanders of Maori descent **(74%)**

Yes significantly higher among:
Males (**39%**)
18-39 years old (**36%**)
Otago (**42%**)
Living in an urban area (**38%**)
University Education – Undergrad (**37%**)
University Education – Postgrad (**54%**)
Chinese (**45%**)
Indian / Pakistani / Sri Lankan (**62%**)

Q10. How informed do you believe you are at present about these genetic technologies?
Base: Those who are aware of the technology (n=2803)

Significant differences in feeling informed about gene editing

FEELING INFORMED ABOUT GENE EDITING PROFILE – AMONGST THOSE AWARE

No significantly higher among:
Females **(72%)**
Other South Island **(75%)**
New Zealanders of European descent / Pakeha **(68%)**
New Zealanders of Maori descent **(74%)**

Yes significantly higher among:
Males (**39%**)
18-39 years old (**37%**)
University Education – Postgrad (**46%**)
Indian / Pakistani / Sri Lankan (**61%**)

Q10. How informed do you believe you are at present about these genetic technologies?
Base: Those who are aware of the technology (n=1741)

Significant differences in feeling informed about genomic selection

FEELING INFORMED ABOUT GENOMIC SELECTION PROFILE – AMONGST THOSE AWARE

No significantly higher among:
Females **(73%)**
Other South Island **(75%)**
Living in a suburban area **(69%)**
High School education **(70%)**
New Zealanders of European descent / Pakeha **(68%)**

Yes significantly higher among:
Males (**41%**)
Otago (**47%**)
University Education – Postgrad (**48%**)
Indian / Pakistani / Sri Lankan (**61%**)

Q10. How informed do you believe you are at present about these genetic technologies?
Base: Those who are aware of the technology (n=1505)

Significant differences in feeling informed about marker-aided selection

FEELING INFORMED ABOUT MARKER-AIDED SELECTION PROFILE – AMONGST THOSE AWARE

No significantly higher among:
Females **(69%)**
40-54 years old **(70%)**
Living in a suburban area **(68%)**
High School education **(68%)**
New Zealanders overall **(68%)**

Yes significantly higher among:
Males (**40%**)
18-39 years old (**40%**)
Living in an urban area (**43%**)
University Education – Postgrad (**48%**)
Indian / Pakistani / Sri Lankan (**59%**)

Q10. How informed do you believe you are at present about these genetic technologies?
Base: Those who are aware of the technology (n=888)

Importance of genetic technologies

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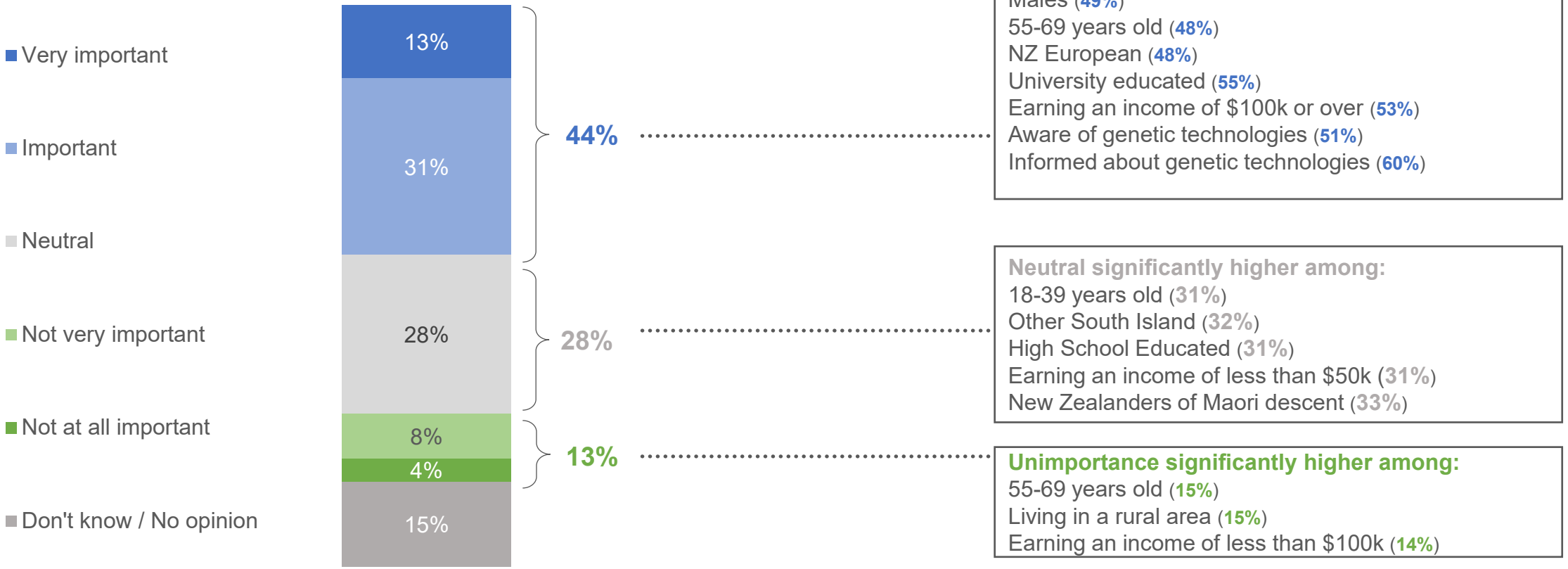
44% of people believe genetic technologies are important for New Zealand's future, significantly more so for those who are aware and feel informed whilst 13% do not think it is important. 55-69 year olds significantly more likely to feel strongly either way.

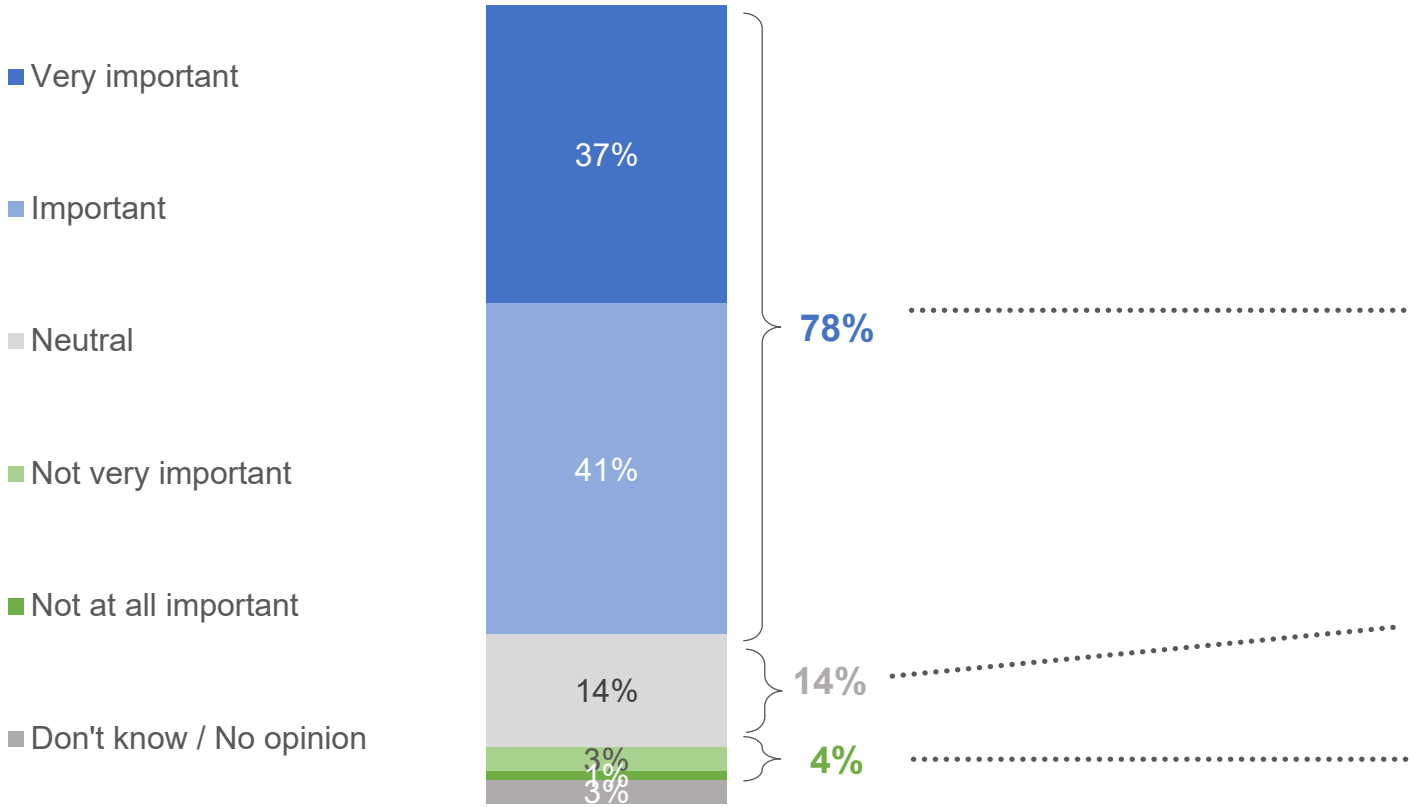
IMPORTANCE OF GENETIC TECHNOLOGIES FOR NEW ZEALAND'S FUTURE



Q11. How important do you believe it is to New Zealand's future to use genetic technologies?
Base: Total sample (n=4042)

A large proportion of New Zealanders feel conservation is important to them personally. This resonates most strongly with older people, those who identify as a New Zealander or are NZ European, females and higher income earners as well as people who have prior awareness of genetic technologies.

IMPORTANCE OF CONSERVATION TO NEW ZEALANDER'S PERSONALLY



Importance significantly higher among:
Females (**82%**) 41% saying *very important*
40-69 year olds (**85%**)
Living in South Island excl. Christchurch and Otago (**84%**)
Living in a rural area (**83%**)
University educated (**82%**)
New Zealanders (**79%**)
NZ European (**81%**)
Earning an income of $100k or over (**86%**)
Aware of genetic technologies (**82%**)

Neutral significantly higher among:
Males (17%)
18-39 year olds (19%)
Waikato (18%)
Living in an urban area (17%)
Earning an income of $50k or less (18%)
New Zealanders of Pacific Island descent (29%)
Chinese (27%)
Indian / Pakistani / Sri Lankan (23%)

Unimportance significantly higher among:
18-39 year olds (**6%**)
Living in Otago (**8%**)
Living in an urban area (**5%**)
High school highest level of education (**5%**)
Earning an income of $50k or less (**5%**)

Q12. How important is conservation to you personally?
Base: Total sample (n=4042)

How accepting are New Zealanders of the use of genetic technologies?

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Scenarios shown to respondents

Scenario A
In the USA, the American Chestnut tree was brought to the edge of extinction by a disease called chestnut blight. Using genetic modification a gene from wheat has been introduced into the DNA of American Chestnut. This has made the tree resistant to the disease and offers a way to save the tree.

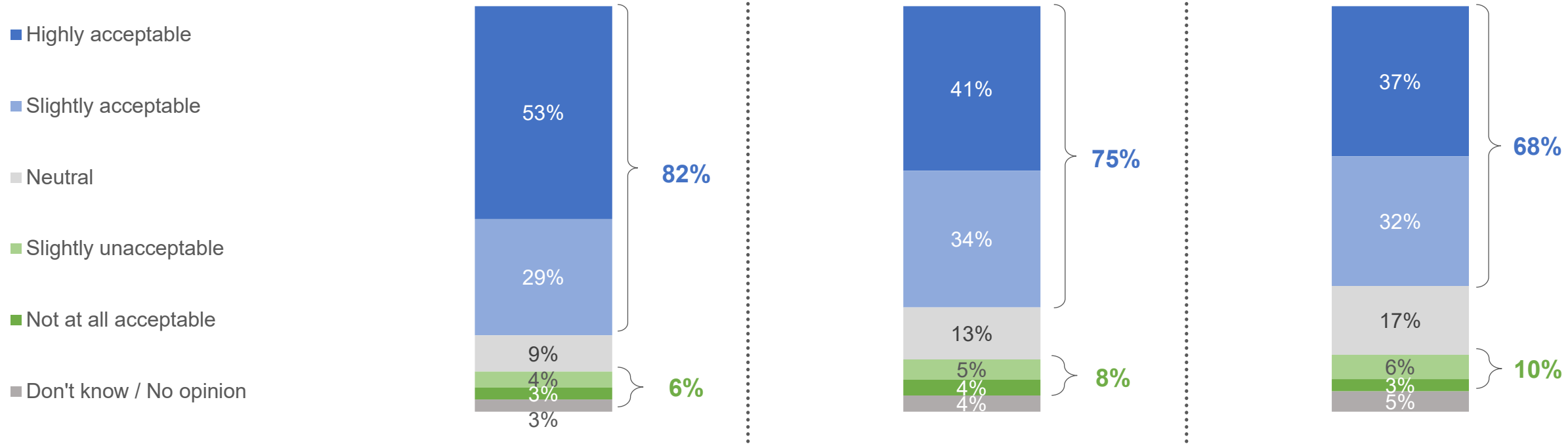
Scenario B:
As you may be aware, in New Zealand's, Kauri trees are dying and could face extinction due to a disease called Kauri Dieback. We now have the technology to save NZ's Kauri trees. This involves editing the Kauri tree's DNA (genetic material) to turn off a particular gene by removing a small part of the DNA. This makes the tree resistant to the Kauri Dieback disease. This process is called gene editing.

Scenario C:
Some conifers produce wildings and can be a big problem in some parts of New Zealand. They occupy large tracts of conservation land where they endanger native ecosystems and alter iconic landscapes. They develop via the spread of seed from non-native species such as Douglas fir, that are planted for timber, shelter belts or erosion control. They are difficult and costly to control and the area they occupy is increasing by approximately 5% each year. Scientists have identified several genes that are essential for cone development. Cones are the source of seeds which create wildings. Gene editing can be used to turn off (inactivate) genes (by removing a small part of the DNA) to prevent cone (and thus seed) formation. This will allow these commercially important trees to be planted without risking the spread of new wildings.

Most New Zealanders would be accepting of the use of genetic technologies to conserve native trees and plants, with the use of gene editing to save the Kauri tree being seen as the most acceptable.

ACCEPTANCE OF THE USE OF GENETIC TECHNOLOGIES

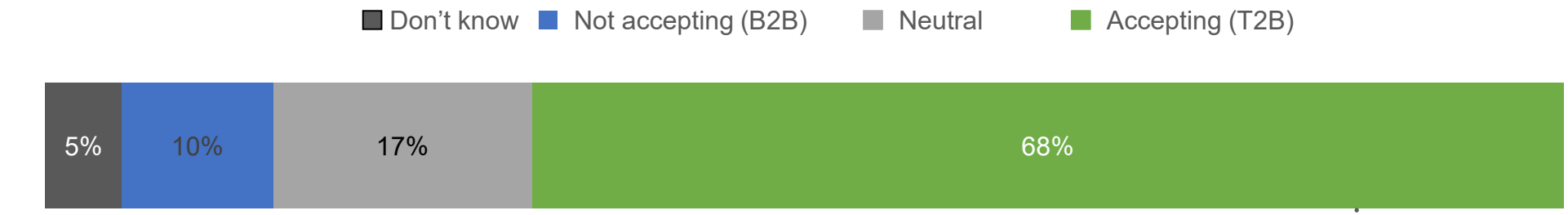
Accepting of at least one	Not accepting of any
94%	6%



Q13. How accepting would you be of using genetic modification / transgenic technology to save the American Chestnut tree? Q14. How accepting would you be of using gene editing technology to save the Kauri tree? Q15. How accepting would you be of using gene editing technology to prevent the generation of new wilding conifers? Base: Total sample (n=4042)

Significant differences in acceptance of the use of gene editing technology to prevent the generation of new wilding conifers

ACCEPTING OF THE USE OF GENE EDITING TECHNOLOGY TO PREVENT THE GENERATION OF NEW WILDING CONIFERS - PROFILE



Not accepting significantly higher among:
40-54 years old **(12%)**
Living in a rural area **(12%)**
Earning an income of $50k or less **(12%)**
Other ethnicity **(18%)**

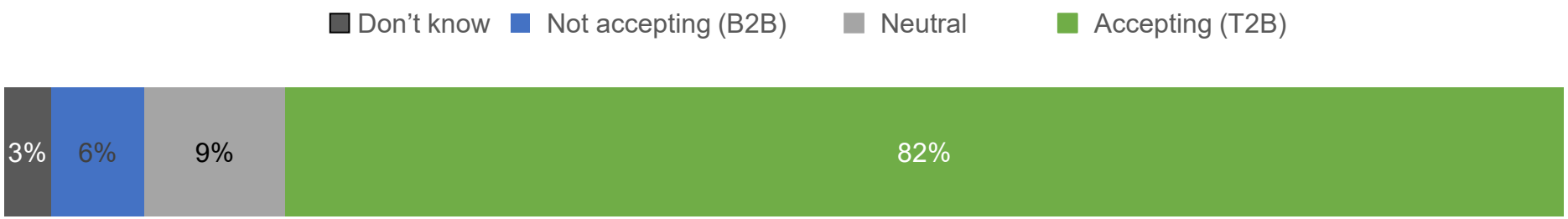
Neutral significantly higher among:
Males (**18%**)
18-39 year olds (**22%**)
Living in an urban area (**20%**)
High School Educated (**19%**)
Earning an income of $50k or less (**18%**)
Indian / Pakistani / Sri Lankan (**24%**)
Conservation not important personally (**26%**)

Accepting significantly higher among:
55-69 years old (**76%**)
University Education – Undergrad (**76%**)
University Education – Postgrad (**74%**)
Earning an income of $100k or over (**77%**)
New Zealanders of European descent / Pakeha (**71%**)
Conservation important personally (**73%**)

Q15. How accepting would you be of using gene editing technology to prevent the generation of new wilding conifers?
Base: Total sample (n=4042)

Significant differences in acceptance of the use of gene editing technology to save the Kauri tree

ACCEPTING OF THE USE OF GENE EDITING TECHNOLOGY TO SAVE THE KAURI TREE - PROFILE



Not accepting significantly higher among:
40-54 years old **(8%)**
Living in a rural area **(9%)**
Earning an income of $50k or less **(8%)**
New Zealanders of Maori descent (**11%**)
Conservation not important personally (**12%**)

Neutral significantly higher among:
Males (**10%**)
18-39 year olds (**12%**)
Living in an urban area (**12%**)
Earning an income of $50k or less (**15%**)
New Zealanders of Maori descent (**11%**)
Asian overall (**13%**)
Feel neutral about conservation (**21%**)

Accepting significantly higher among:
Females (**84%**)
55-69 years old (**87%**)
University Education – Undergrad (**86%**)
Living in a suburban area (**84%**)
Earning an income of $100k or over (**88%**)
New Zealanders of European descent / Pākehā (**84%**)
Conservation important personally (**86%**)

Q14. How accepting would you be of using gene editing technology to save the Kauri tree?
Base: Total sample (n=4042)

Significant differences in acceptance of the use of genetic modification / transgenic technology to save the American Chestnut tree

ACCEPTING OF THE USE OF GENETIC MODIFICATION / TRANSGENIC TECHNOLOGY TO SAVE THE AMERICAN CHESTNUT TREE - PROFILE

Not accepting significantly higher among:
40-54 years old **(11%)**
Earning an income of $50k or less **(11%)**
New Zealanders of Maori descent (**12%**)
New Zealanders of Pacific Island descent (**12%**)
Pacific Islanders (**20%**)
Conservation not important personally (**14%**)

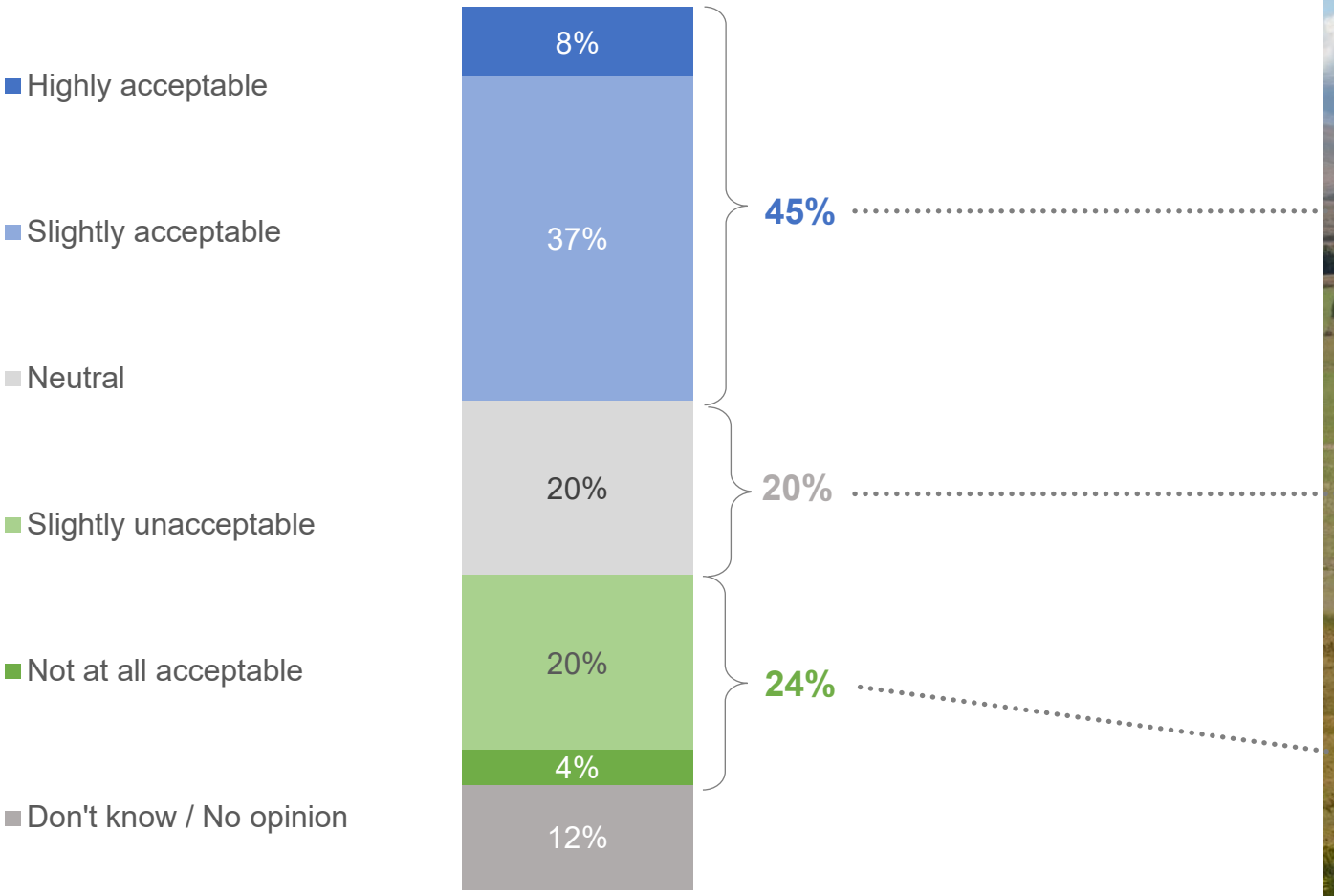
Neutral significantly higher among:
Males (**15%**)
18-39 year olds (**16%**)
Living in an urban area (**16%**)
Earning an income of less than $50k (**19%**)
Asian overall (**20%**)
Feel neutral about conservation (**29%**)

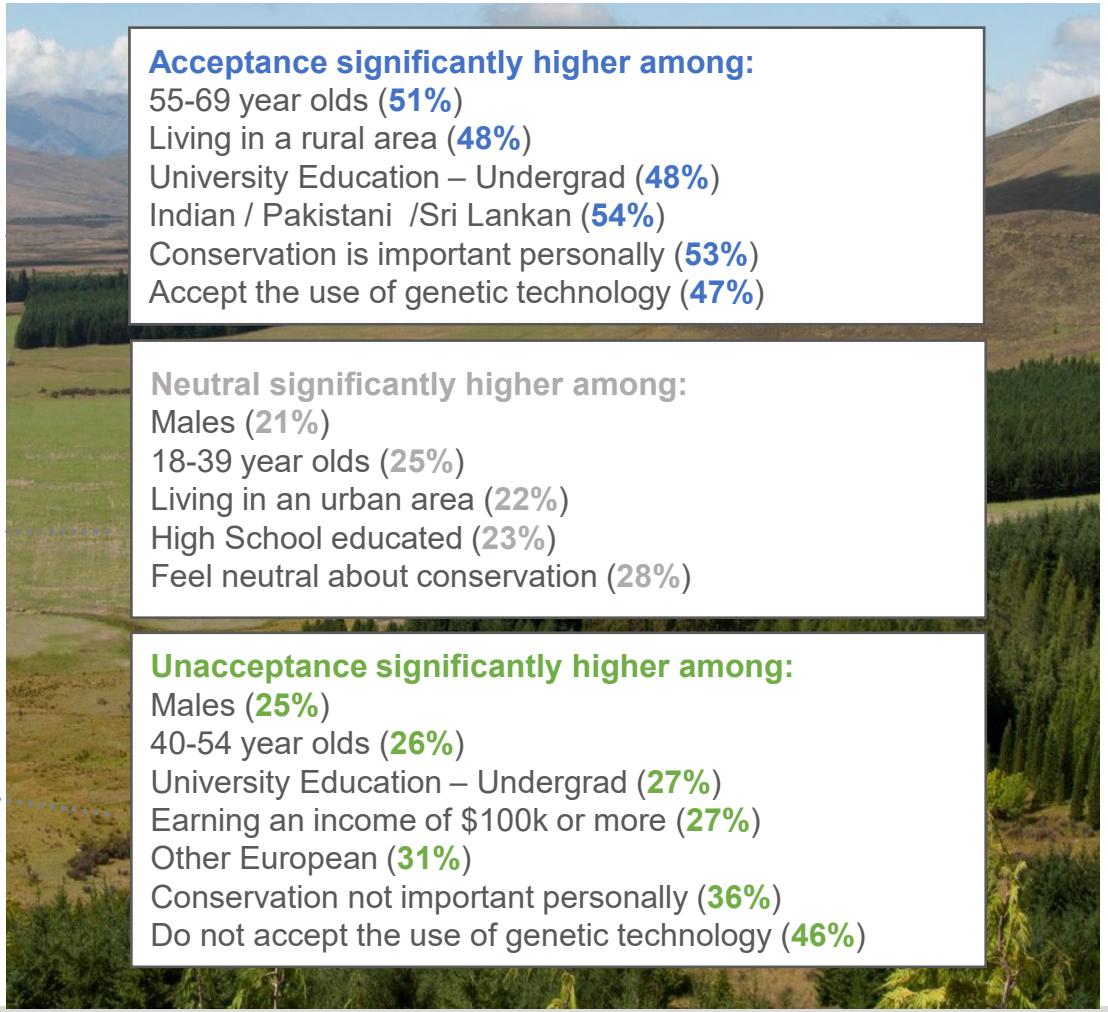
Accepting significantly higher among:
Females (**77%**)
University Education – Undergrad (**80%**)
Living in a suburban area (**77%**)
Earning an income of $50-$99,999k (**77%**)
Earning an income of $100k or over (**84%**)
New Zealanders of European descent / Pākehā (**78%**)
Conservation important personally (**80%**)

Q13. How accepting would you be of using genetic modification / transgenic technology to save the American Chestnut tree?
Base: Total sample (n=4042)

Just under half of New Zealanders think others would be accepting of the use of gene editing technology, despite the majority accepting the use of the technology in specific scenarios for the purpose of conservation.

How accepting do you think other New Zealanders will be of gene editing technology?





Acceptance significantly higher among:
55-69 year olds (**51%**)
Living in a rural area (**48%**)
University Education – Undergrad (**48%**)
Indian / Pakistani /Sri Lankan (**54%**)
Conservation is important personally (**53%**)
Accept the use of genetic technology (**47%**)

Neutral significantly higher among:
Males (**21%**)
18-39 year olds (**25%**)
Living in an urban area (**22%**)
High School educated (**23%**)
Feel neutral about conservation (**28%**)

Unacceptance significantly higher among:
Males (**25%**)
40-54 year olds (**26%**)
University Education – Undergrad (**27%**)
Earning an income of $100k or more (**27%**)
Other European (**31%**)
Conservation not important personally (**36%**)
Do not accept the use of genetic technology (**46%**)

Q16. How accepting do you think other New Zealanders will be of gene editing technology?
Base: Total sample (n=4042)

Xx/Xx Significantly higher lower than total

Summary

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In summary…

Awareness of genetic technologies

Most New Zealanders have heard of genetic technologies on some level. Genetic modification is the most known, followed by gene editing, genomic selection and the least known is marker-aided selection with only a fifth having heard of the technology before.

When we look at the profiles of those who are aware of genetic technologies versus those who are not there are some differences. Males are more likely to have heard of a genetic technology, as have people aged 55-69 years old. People with a university education and in the higher income bracket are also more likely to have heard of genetic technologies while younger people and those living in urban areas are less likely to have heard of these technologies. There are also some differences in ethnicity, while NZ Europeans are more likely to be aware, those who identify as Maori or Pacific are less likely to have heard of genetic technologies.

Knowledge and importance of genetic technologies

Although awareness at an overall level is relatively high, this does not mean that people feel informed about genetic technologies, with less than 3-in-10 saying they feel informed about at least one type. Genetic modification is the technology people feel most informed about with fewer feeling informed about gene editing, genomic selection and marker-aided selection. Even among people who are aware of each technology most do not feel informed.

When asked about the importance of genetic technologies for New Zealand's future 44% of people believe it is important. This view significantly increases among people who are already aware of or feel informed about genetic technologies. Males, older people aged 55-69 years, NZ Europeans, university educated and higher earners are also significantly more likely to believe in the importance of genetic technologies. More people feel conservation is important to them personally (78%) and this is felt most strongly by females, people who identify as New Zealanders, higher income earners, and people aged 40 years and over.

Acceptance of the use of genetic technologies

When given context for the use of genetic technology with specific scenarios, most people would be accepting of it's use. This is particularly true for the use of gene editing to save the Kauri tree. Those who are more likely to be accepting of these scenarios overall are 18-29 year olds or higher income earners. People who identify as Pacific Islanders, on lower incomes or have no prior awareness of genetic technologies are more likely to say they would not be accepting of their use.

Interestingly, although most people would be accepting of the use of genetic technologies for the purpose of conservation, less than half thought other New Zealanders would be accepting of gene editing technology. However, people who themselves accept the use of genetic technologies are more likely to believe others would also be accepting.

With the importance of conservation at a personal level being high for many, an opportunity exists to increase people's perception of the importance of genetic technologies to the future of New Zealand by increasing awareness of the technologies used in New Zealand and then bridging the gap between being aware and feeling informed through education about the use of genetic technologies for conservation.

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