



A Year in Review

July 2022–June 2023



HIGH-VALUE
NUTRITION



Ko Ngā Kai
Whai Painga

National
SCIENCE
Challenges

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Our Purpose

The core purpose of the High-Value Nutrition | Ko Ngā Kai Whai Painga National Science Challenge is to develop high-value foods with validated health benefits to drive economic growth for Aotearoa New Zealand.

We invest in science excellence and building collaborative relationships between research and industry to create new platforms, build capabilities and enable innovation.

About Us

The objective of the High-Value Nutrition | Ko Ngā Kai Whai Painga National Science Challenge (HVN NSC) is to **develop high-value foods with validated health benefits to drive economic growth**.

The HVN NSC runs four Priority Research Programmes in the following areas of health: **Digestive, Immune, Infant and Metabolic**. We have a multitude of projects in other aligned health areas.

Underpinning the HVN NSC research programmes and projects are two Enabling Programmes – the **Science of Food** and **Consumer Insights** – which ensure that investigational products in our programmes are desirable for consumers, are innovative and are suitable to be taken as food.

Last year HVN added the **He Rourou Whai Painga** National Dietary Intervention study. This innovative project focuses on the health outcomes of those consuming a predominantly Aotearoa New Zealand-derived diet.

The HVN NSC is funded by the New Zealand Ministry of Business, Innovation and Employment (MBIE) and is hosted at the Liggins Institute, University of Auckland, with the University of Otago, Massey University, AgResearch and Plant & Food Research its primary collaborating parties. HVN's scope of funding and collaboration is not limited to these institutions and it supports projects across Aotearoa New Zealand. Funding support for HVN will end in June 2024.

Our Strategy

HVN invests in research projects that enable Aotearoa New Zealand's Food & Beverage (F&B) companies to move from being trusted suppliers of foods that are not only safe to eat, but also designed to support sustained good health.

With the completion of the HVN workstreams now happening, focus shifts to the dissemination of research findings. Through publications and media promotions of study results, HVN hopes to enhance consumer engagement in the high-value foods sector, leading to economic growth, and to encourage other food and beverage companies/organisations to invest in scientific research.

Our Highlights

8

Year programme of a series of clinical studies on Greenshell™ mussels was completed in collaboration with Sanford Ltd, showing benefits to joint and muscle health.

200

Individuals and their whānau were successfully recruited to the national dietary intervention study He Rourou Whai Painga, which aims to tackle type-2 diabetes and other metabolic diseases. Over **30** food and beverage companies are collaborating to provide products.

12

Contestable projects were completed over the last year.

200

Researchers and businesses were brought together at Foodomics 2022 to highlight achievements and collaborations to date.

13

Pūhoro STEMM Academy students were successfully placed into research internships and work placements with the support of HVN.

35

Projects were funded over the last 4 years, **28** of which have been completed.

80

Organisations have collaborated with High-Value Nutrition researchers since HVN's inception, with investigations into over **130** food and beverage products.

65

Peer-reviewed papers have been published in the last 12 months, describing research that was directly supported through the HVN NSC.

Our Science

Impact

The primary objective of HVN is to work with industry and academic partners to promote the development of foods with improved nutritional qualities and to provide research guidance and financial support to investigate food-health relationships.

The findings that emerge provide businesses with the evidence base to support product health claims and provide dietary information to public health workers and consumers.

Additionally, HVN seeks to develop the science infrastructure in New Zealand to aid research in food and health.

The HVN science programme consists of two main parts: a series of 'Priority Research Programmes' that have provided long-term funding to research programmes in four areas of food and health research; and a 'Contestable Research Programme' that invited proposals from academic-industry partnerships to undertake specific research projects that usually last between one and three years.

Complementing these components is an ambitious community-based whole diet intervention study He Rourou Whai Painga.

Priority Research Programmes

Digestive Health Programme

The Digestive Health Programme led by Professors Nicole Roy and Richard Gearry of University of Otago continues to analyse the data generated from across its research portfolio, leading to a greater understanding of the linkages between diet, gastrointestinal symptoms, gut physiology and the gut microbiome.

The Digestive Health Programme exemplifies how the interaction between academic scientists and clinicians and the adoption of new technologies can deliver world-class science excellence with societal and economic impact.

A significant part of the Programme has been facilitated through the establishment in Tranche 1 of a participant cohort, named COMFORT. Metabolic and microbiome analyses of participants within the COMFORT cohort highlighted differences between participants with gastrointestinal symptoms and symptom-free control participants. It has been instrumental in the development of assessment tools that have been used in several studies in Tranche 2 in collaboration with industry partners.

Infant Health Programme

The Infant Health Programme is led by Professor Clare Wall of the University of Auckland.

The main component within this Programme is the SUN clinical study, which is now entering its final phase of recruitment of mother-infant dyads. The study focuses on infant consumption of a kūmara-based weaning product to test the hypothesis that the complex carbohydrates in kūmara will encourage the development of a beneficial gut microflora which, in turn, will stimulate the immune system.

A second clinical trial that investigates the acute impact of a sheep milk-based complementary weaning food on infants' gut health is underway.

Immune Health Programme

The Immune Health Programme led by Dr Olivier Gasser of the Malaghan Institute of Medical Research is forging ahead with the development of a new technology platform METFLOW to assess complex biomarkers of immune and metabolic health through flow cytometric-based analyses of human peripheral blood mononuclear cells following dietary interventions.

There is considerable industry interest in the further development of this platform. Findings from the study are being disseminated to industry partners, the academic community and the public via peer-reviewed scientific articles.

Metabolic Health Programme

The Metabolic Health Programme led by Associate Professor Jennifer Miles-Chan of the University of Auckland continues to seek to understand the links between ethnicity, diet and risk of type-2 diabetes, building upon the TOFI cohort study undertaken in Tranche 1 of HVN, largely through the SYNERGY study described on page 7.

Two further human studies have been initiated this year. The FERDINAND study is seeking to test the hypothesis that a feijoa-based food product will improve biomarkers of metabolic health and help to maintain a healthy weight. A study supported by Tatua is investigating the acute effects of a dairy protein (whey) hydrolysate on postprandial metabolism in healthy adults.



Whole-diet intervention studies

During the last nine years of HVN, research projects within the Priority Research Programmes have focused on functional properties of individual food products, such as gold and green kiwifruit to maintain and promote a healthy digestive system and to promote metabolic health. This approach is entirely appropriate as individual companies seek to add value to their own branded products.

Over the last three years, the focus on individual food products has expanded to a whole-diet approach, recognising that dietary patterns and combinations of foods may have additive or synergistic functional activities to promote health.

The whole diet approach has been adopted within two studies: the SYNERGY study undertaken within the Metabolic Health Programme; and the He Rourou Whai Painga (HRWP) study led by Professor Jeremy Krebs of the University of Otago.

SYNERGY

The SYNERGY study is a fully-controlled dietary intervention that explores how diet interacts with ethnicity to modulate the plasma metabolome. It builds upon the TOFI cohort study in HVN Tranche 1, in which differences were observed in the plasma metabolome (i.e. the chemicals in the blood) between ethnic Chinese and ethnic Europeans, with the former having a greater risk of type-2 diabetes. SYNERGY seeks to explore the biological basis of the metabolic differences.

Participants in SYNERGY live within the Human Nutrition Unit at the University of Auckland for a two-week period to ensure high compliance with an experimental diet. Thirteen New Zealand F&B Industry partners participate in the study by providing food products that complement each other and may offer some form of nutritional synergy. The SYNERGY study is now entering its final phase and will be completed in early 2024.

He Rourou Whai Painga

He Rourou Whai Painga (HRWP) is an ambitious study involving the University of Otago; the University of Auckland; Plant and Food Research; Tu Kotahi Māori Asthma Trust; the University of Otago Centre for Endocrine, Diabetes and Obesity Research (CEDOR); and Manawaora Integrated Health and Research Ltd.

It brings together over 30 New Zealand F&B companies in a single study. The study design is novel and complex. It combines a 12-week randomised controlled trial of a plant-rich dietary pattern based on predominantly New Zealand produced products, behaviour change support, with a subsequent 10-month longitudinal observation study. The initial 12-week intervention phase is followed by a secondary randomisation to receive or not receive continued behaviour change support.

Two hundred participants and their whānau have been successfully recruited into the study. HRWP seeks to provide evidence that a 'New Zealand' diet based upon the principles within the Mediterranean dietary pattern can promote and maintain metabolic health.

Contestable projects

12

Contestable projects were completed over the last year.

Native plants

Te Wai o Rongoā

John Te Amo, Macorja Group Limited; Massey University; AgResearch

Objective: To explore the interface between Mātauranga Māori knowledge system and Western Science in the creation and development of a Wairākau functional beverage informed by Rongoā knowledge and taonga species.

Outcomes: Testing of the product showed the presence of compounds that align with Mātauranga Māori.

Mamaku Smoothie Project

Garry Watson, Te Taiao Innovations; Massey University

Objective: To assess the feasibility of using freeze-dried Mamaku as an ingredient in two smoothie prototypes and regulatory requirements.

Outcomes: A product using Mamaku was developed.

Mamaku Whakaoraora

Dr Pramod Gopal and Dr John Monroe, Plant & Food Research; Massey University; Nga Uri o te Ngahere Trust; Te Rangatahi o te Whenua Trust

Objective: To provide an evidence-based foundation for establishing Mamaku (*Cyathia medullaris*, tree fern) as a highly functional natural food, with an indigenous whakapapa, and a strong capacity to improve a range of metabolic and gut health conditions.

Outcomes: The project has been completed. Much useful data has been collected but currently not published due to IP issues.

Native aquatic

Greenshell™ mussels for inflammation, metabolism and muscular skeletal function

Dr Matt Miller, Cawthron Institute; Massey University; Christchurch Clinical Studies Trust; Sanford Ltd

Objective: To identify and validate the health benefits of Greenshell™ mussels (GSM) and gain a better understanding of the relationships between inflammation, metabolism and musculoskeletal function.

Outcomes: Two studies have shown GSM can reduce recovery time in men after intense exercise, with an additional study showing GSM may reduce joint pain in post-menopausal women.

1. Abshirini, M., Coad, J., Wolber, F. M., von Hurst, P., Miller, M. R., Tian, H. S., & Kruger, M. C. (2022). Effects of Greenshell™ mussel intervention on biomarkers of cartilage metabolism, inflammatory markers and joint symptoms in overweight/obese postmenopausal women: A randomized, double-blind, and placebo-controlled trial. *Frontiers in Medicine*, 9.
2. Abshirini, M., Coad, J., Wolber, F. M., von Hurst, P., Miller, M. R., Tian, H. S., & Kruger, M. C. (2023). Effect of green-lipped mussel (*Perna canaliculus*) supplementation on faecal microbiota, body composition and iron status markers in overweight and obese postmenopausal women: a randomised, double-blind, placebo-controlled trial. *Journal of Nutritional Science*, 12.
3. Lomiwes, D., Barnes, M., Shaw, O., Ngametua, N., Sawyer, G., Burr, N., & Miller, M. R. (2023). The Efficacy of New Zealand Greenshell™ Mussel Powder Supplementation in Supporting Muscle Recovery Following Eccentric Exercise-Induced Muscle Damage in Healthy, Untrained Adult Males. *Nutrients*, 15(10).
4. Taylor, M. C., Roberts, R. D., & Miller, M. R. (2023). A Lipidomic Profile of a Sustainable Source of Omega-3 Long-Chain Polyunsaturated Fatty Acids, Greenshell Mussels™, *Perna canaliculus*. *Sustainability*, 15(9), 7586.
5. Lomiwes, D., Barnes, M., Shaw, O. M., Ngametua, N., Sawyer, G. M., Burr, N. S., & Miller, M. R. (2023). Characterising the Cytokine and Circulating Immune Cell Response After a Single Bout of Eccentric Stepping Exercise in Healthy Untrained Males. *Journal of Science in Sport and Exercise*, 1-13.
6. Slade C, et al, 2023. American Society of Nutrition Conference poster.

Mussel with fucoidan as supplemented superfood – product development and clinical benefits

Professor Nicola Kayes, Auckland University of Technology; Professor Jun Lu, University of Auckland; National University of Singapore; Beyond Capital MedTech Management Ltd

Objective: To develop a new GSM-Fucoidan food product and scientifically validate its health benefits relating to anti-inflammatory properties, immune stimulation and glycaemic control in people with pre-diabetes or experiencing joint pain in a Chinese population in New Zealand.

Outcomes: Data is currently being analysed. Patent on formulation has been filed.

1. Tay, A., Jiang, Y., Signal, N., O'Brien, D., Chen, J., Murphy, R., & Lu, J. (2022). Combining mussel with fucoidan as a supplement for joint pain and prediabetes: Study protocol for a randomized, double-blinded, placebo-controlled trial. *Frontiers in Nutrition*, 9.
2. Nadeeshani, H., Hassouna, A., & Lu, J. (2022). Proteins extracted from seaweed *Undaria pinnatifida* and their potential uses as foods and nutraceuticals. *Critical Reviews in Food Science and Nutrition*, 62(22), 6187-6203.

Non-native plants

Development of an anti-pollution sports drink and its efficacy in active individuals

Dr Andrea Braakhuis, University of Auckland; Ārepa

Objective: To investigate the efficacy of an Ārepa drink in relation to active individuals.

Outcomes: A pilot study has investigated the effectiveness of Ārepa in mitigating the effects of pollution on exercise with the use of elevated ozone as a proxy for air pollution. Non-significant differences were found between Ārepa product and placebo.

1. Morton, L., & Braakhuis, A. J. (2021). The Effects of Fruit-Derived Polyphenols on Cognition and Lung Function in Healthy Adults: A Systematic Review and Meta-Analysis. *Nutrients*, 13(12), 4273-4273.
2. Morton L., Paton, C.D., Merry, T., and Braakhuis A (2023). Effects of 7-day polyphenol powder supplementation on cycling performance and lung function in an ozone-polluted environment.

Differences of New Zealand hemp seed oil based on composition

Dr Heike Schwendel, Plant & Food Research; Hemp Connect

Objective: To explore the differences in New Zealand hempseed oil and provide a platform for future research on its benefits.

Outcomes: Following nutritional analyses the study showed New Zealand hemp has comparable nutrition to overseas grown hemp.

Potential health claims – establishing the baseline for New Zealand cherries

Mark Carrington, Cherri Health & Manufacturing Ltd

Objective: To explore the bioactive and nutrient properties of six popular cherry varieties.

Outcomes: Nutritional analyses showed New Zealand grown cherries may have some nutritional advantages that are not lost with processing.

Meat and dairy

Pasture-raised Advantage: The role of New Zealand pasture-raised red meat on nutrition, health and wellness in humans

Dr Andrea Braakhuis, University of Auckland; Dr Emma Bermingham, AgResearch; Meat Industry Association Innovation; Beef + Lamb New Zealand

Objective: To understand the role of New Zealand red meat in healthy lifestyles through its effects on human nutrition, health and psychological wellness outcomes.

Outcomes: An acute and longer term studies were undertaken in which the main comparison was between meat and meat-analogues. Some differences in amino acid absorption were noted, but longer terms outcomes were not shown.

1. Gillies, N. A., Worthington, A., Li, L., Conner, T. S., Bermingham, E. N., Knowles, S. O., & Braakhuis, A. (2023). Adherence and eating experiences differ between participants following a flexitarian diet including red meat or a vegetarian diet including plant-based meat alternatives: findings from a 10-week randomised dietary intervention trial. *Frontiers in Nutrition*, 10, 1174726.
2. Pham T, et al, 2022, *Current Developments in Nutrition*.

Deer Milk impact on nutritional status and physical function in older adults

Professor Marlena Kruger, Massey University; Pāmu

Objective: To investigate the role of deer milk in supporting a healthy lifestyle and improving general nutrition in a community-dwelling older population over the age of 65.

Outcomes: A clinical trial showed deer milk can maintain muscle mass in older women similar to current supplements.

1. Kruger, M. C., Mazahery, H., Mugridge, O., Turner, S., & von Hurst, P. (2023). A comparative intervention trial of deer milk and an oral nutritional supplement efficacy for improving older adults' nutritional status, muscle mass and physical performance. *Clinical Nutrition ESPEN*, 57, 346-357.

Other food groups

Unlocking the power of seaweed for human health

Clare Bradley, AgriSea

Objective: To produce a novel fermented seaweed beverage with functional health benefits.

Outcomes: A fermented seaweed beverage was developed.

Infant Nutrition

Variable Nutrition in Pre-Term Babies

Liggins Institute

Objective: To investigate the variation in amount and type of nutrition provided to babies in New Zealand, with corresponding variation in outcomes such as growth and mortality.

Outcomes: Internship completed at Liggins, and work presented at Global Young Scientists Summit 2022 in Singapore. Student plans to continue postgraduate studies.

Our Business

Stakeholder Engagement

Stakeholder engagement continued to be positive throughout 2022–2023. Media coverage has been both domestic and international, which demonstrates the wide range of interest shown in HVN-funded research, its findings and outputs, and in the New Zealand F&B sector.

HVN has fulfilled a unique need in the New Zealand funding landscape. Outside of the research findings and associated business growth, a collaborative network across the country has been formed among researchers, with businesses also finding many benefits. While economic benefits are largely too early to quantify, we have seen businesses create an innovation culture and become more attractive employers as a result of the HVN-funded research.

In the HVN Annual Impact Survey responses, businesses reported an array of non-financial impacts received through their collaboration with HVN.

The HVN funding has:

- Supported businesses achievement of industry awards
- Enhanced employment opportunities
- Enabled businesses to secure funding from other sources
- Enabled the identification of the nutritional profile of products
- Led to a pipeline of new products being developed
- Provided strong credentials to open discussions on opportunities with other research institutions
- Enabled the entry of companies into new markets because of the evidence-based science that underpins product health claims

HVN has provided a range of grants tailored to the size and strategy of businesses, supporting their R&D journeys, with the majority of companies expressing interest to invest in future innovation.

HVN has developed policies with regards to the protection of taonga species, which has strongly underpinned projects and sets a model for future collaborations.

Foodomics 2022: 8–9 September 2022



The HVN Foodomics conference was a particular highlight of 2022. The conference was a huge success, attracting 200 attendees and providing a forum for HVN researchers and industry partners to present their work and impacts.

Feedback from a post-conference survey was very positive, with attendees commenting on how great it was to see the integration of businesses and researchers, particularly in the combined presentations. The impact on Māori-owned businesses was strongly recognised.

HVN has taken all feedback on board and aims to make Foodomics 2024 a truly celebratory event, featuring a large contingent of students and early career researcher presenters.

200 Delegates from the F&B Industry, research and academia, and Government.

30 Presentations showcasing research across the Contestable Fund and Priority Research and Enabling Programmes.

With HVN heading into its final year, the focus will be on communicating the incredible research that has been carried out. Key to this is to ensure all ideas, learnings, opportunities and ongoing outputs are shared. This will ensure that HVN stakeholders receive as much value as possible from the Challenge prior to its completion in June 2024.

Giving effect to Vision Mātauranga

The Co-Governance model that was brought into effect in 2022 has continued well, with Board members expressing strong support for the approach. Following Arohaina Owen's departure from HVN, Dr Jane Mullaney (Ngāti Porou, Ngāti Raukawa) has come onboard as the new Vision Mātauranga leader. Jane has been with the Challenge as a researcher since 2017 and her strong community networks and skills in relationship building have brought much value to the Challenge.

HVN has continued to implement its Vision Mātauranga action plan, which has a focus on Māori businesses and rangatahi, and has been facilitating stronger relationships between the businesses and research organisations, helping them to weave connections together from a position of independence. As many of the projects with Māori businesses were small grants, we have seen the completion of a number of these.

HVN continues to support the Pūhoru STEMM Academy. Over the 2022/23 summer, the Academy placed 73 rangatahi in science internships (an increase from 46 interns in the year prior), 13 of which were directly co-funded by HVN and related to the F&B space. One of these rangatahi has since enrolled as a PhD student working on the He Rourou Whai Painga study.

The Foodomics 2022 conference programme clearly showed HVN's commitment to Vision Mātauranga and Māori F&B innovations, with speakers including a focus on Wai262, the Pūhoru STEMM Academy and innovation journeys. Post-conference feedback highlighted the strength of the programme and success of the event as shown in the following quotes:

"The session from the development grant recipients was awesome! I loved learning about their work and the collaboration between business and science. Love the fact that it was Māori businesses too, and the integration of te reo Māori and tikanga Māori. Ka rawe! Awesome!"

"I loved the integration of te reo Māori and tikanga Māori, including by many of the presenters. Thank you for including that!"

HVN continues to support emerging Māori researchers through scholarships and internships. As many of these students are nearing the end of their studies, their work will be showcased in a Foodomics 2024 session, and HVN will support them where needed in determining the next steps in their careers.

Public Awareness

Public communication is key to the Challenge raising awareness of HVN's research activities and engaging the public in HVN's science.

It enables the Challenge to share results that help the public to make healthy dietary choices, support HVN industry partners by raising awareness of research results, and support HVN researchers to recruit trial participants.

Launching He Rourou Whai Painga



The launch of the He Rourou Whai Painga study (HRWP) provided opportunities, both in person and through the media, for researchers and industry to share in the goals and objectives of the study.

>1000

Expressions of interest from the public to take part in the study.



HRWP Principal Investigator Jeremy Krebs talks to *Newshub* about the study.

[Watch now](#)

25

Items of media coverage across television (*TV3*), radio (*RNZ*, *Newstalk ZB*) and print and online news (*Stuff*); lifestyle and business magazines (*NBR*, *Woman*); industry news (*Farmers Weekly*); international media (*NutraIngredients/Food Navigator*); and Māori media (*Waatea News*).

140

Media pieces

The Challenge has received three times as much media coverage than the previous year – a reflection of the numerous storytelling opportunities, with a focus on sharing research outcomes.

HVN's work was covered by mainstream media outlets (*Stuff, New Zealand Herald, Newsroom, RNZ* etc.) and increasingly in industry media (*Farmers Weekly, Rural News, Orchardist* etc.).



A *Food Navigator/Nutra Ingredients Spotify* podcast with Professor Marlena Kruger, Principal Investigator for the Contestable Fund Pāmu deer milk study, gave international coverage to HVN's research, including to international consumers.

[Listen now](#)

- The Challenge sends a quarterly newsletter, *HVN Pānui*, to a highly-engaged audience of the public, scientists and F&B industry.
- The HVN website is a key point for engagement with HVN – website visits increased to **30,000** in the last year.
- HVN is active on LinkedIn and Twitter. LinkedIn being HVN's most popular social media channel, with a **19%** increase in LinkedIn followers over the last year.
- HVN's Science of Food programme ran two free 'lunch and learn' webinar series for New Zealand's F&B industry: *Scanning the Horizons: Patent Insights, Regulatory and Market Trends 2023*; and *IP Strategy Roadmap for Food & Beverage Companies*.

Our Governance and Management

Governance Updates

During the past year the HVN team saw the departure of Simmon Hofstetter (Research Operations Manager) and Arohaina Owen (Vision Mātauranga Lead). However, these positions were quickly filled by Helen Madden, who joins us as Research Operations Manager on a secondment from within the University of Auckland, and Jane Mullaney who combines her position of Vision Mātauranga Lead with her role as Senior Scientist at AgResearch.

For the HVN Board and Directorate, emphasis was placed on maintaining a strategic focus across the HVN research portfolio, with plans now firmly underway for its successful completion. Over the next 12 months a particular focus will be placed on: 1) the timely and successful completion of all HVN projects and 2) the allocation of remaining funds to support the completion of clinical trial recruitment, biological sample analyses and publications.

The Research Data Management (RDM) project continues to forge ahead with a focus on the collation of data from across HVN projects and programmes. The legacy meta-data catalogue, a key output from the project, is developing well thanks to the new RDM project team, Laura Armstrong and Selina Patel, who are busy finalising the collation of clinical-trial information. The next phase entails publishing the trial information on a University-based database, which will be open and accessible to researchers internationally. The team are working with the HVN Directorate to ensure Māori data sovereignty principles are considered throughout the project.

As HVN heads into the final year of the Challenge, 27 projects are scheduled to be completed before the end of June 2024. The full impact of these, particularly in terms of outputs and publications, may not be known until the end of the Challenge. However, HVN are working towards ensuring as much information will be available and accessible once funding has ceased and the team disbanded.