Ministry for Primary Industries
Manatū Ahu Matua

MPI Insights

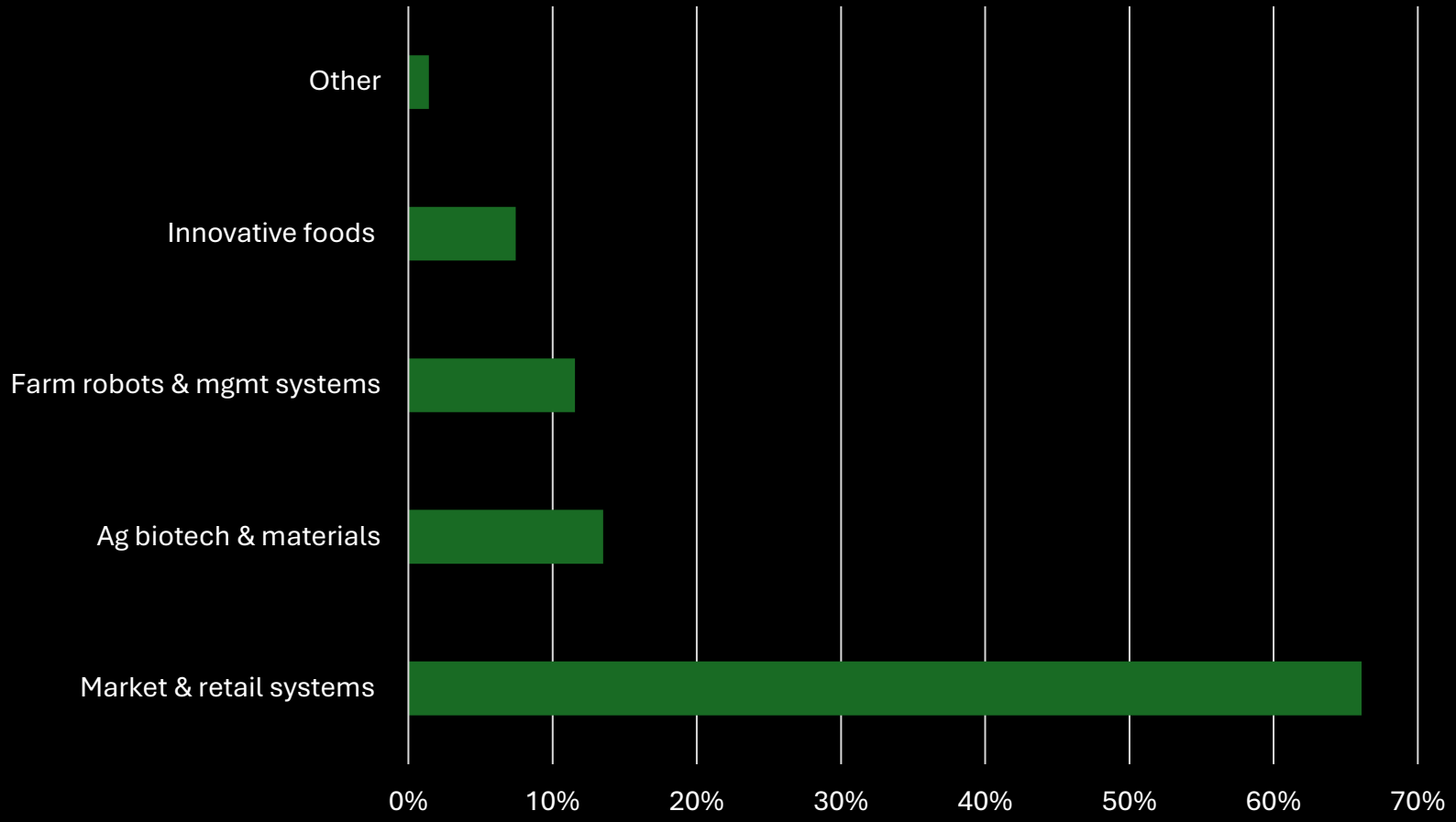
NZFSSRC

Technologies shaping future nature-based economies

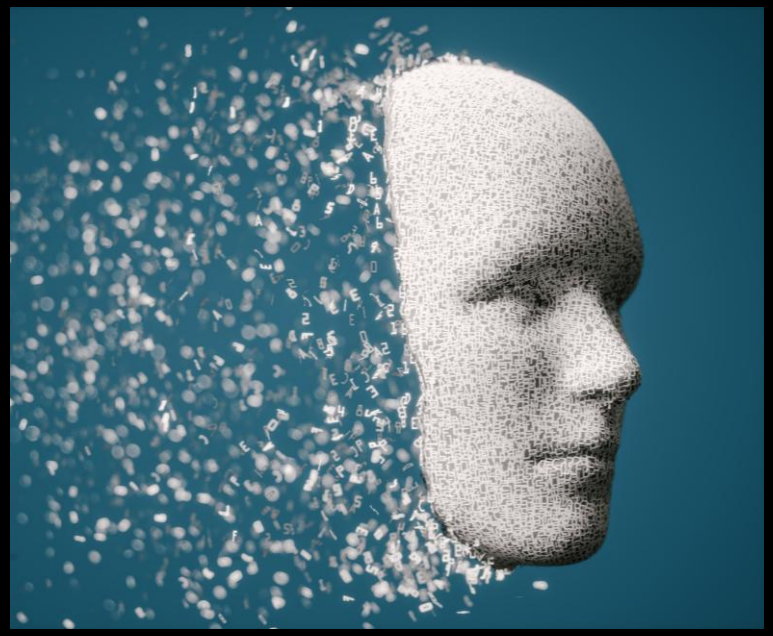
Where the global food system is investing

Over the last 12 years global investment continues skew the market

The greatest investment in the global food system continues to be on the consumer – their accessibility, experience and convenience…



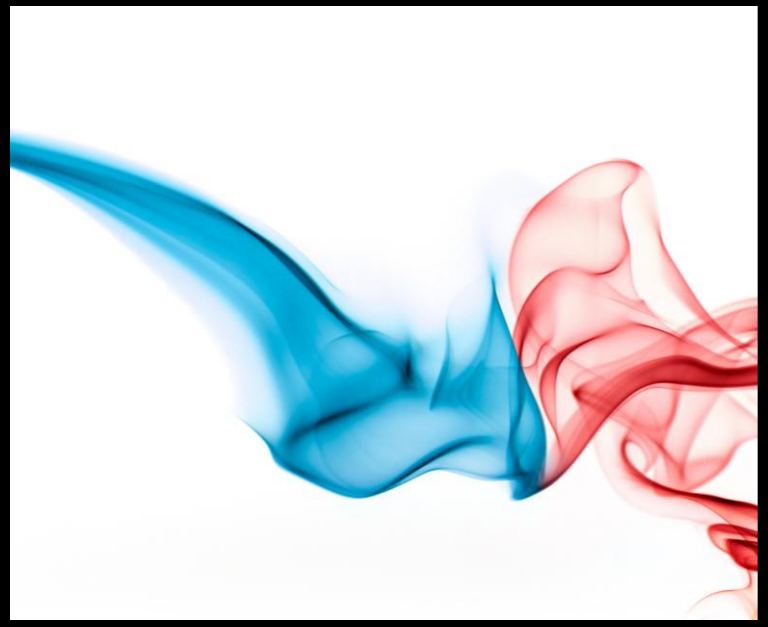
Technologies are converging and advancing exponentially…



AI gains inference and reasoning - LLMs continue to become more powerful:

- Mid 2024 – bet avg US IQ at 98
- Early 2025 – bet PhD experts on their chosen topic
- Mid 2025 – bet all PhDs across all topics

When can AGI and SGI be achieved?



AI led gene tech – are merging to create new capabilities and make rapid advancements - has now been used to design CRISPR gene-editing proteins OpenCRISPR-1.

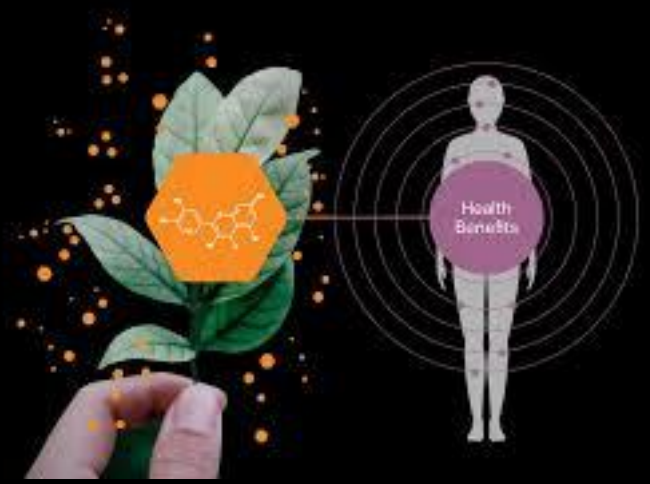
Multiple AI capabilities – ProFluent's ProGen (California) and Stanford University's EVO AI models are both actively seeking to create more AI designed CRISPR tools

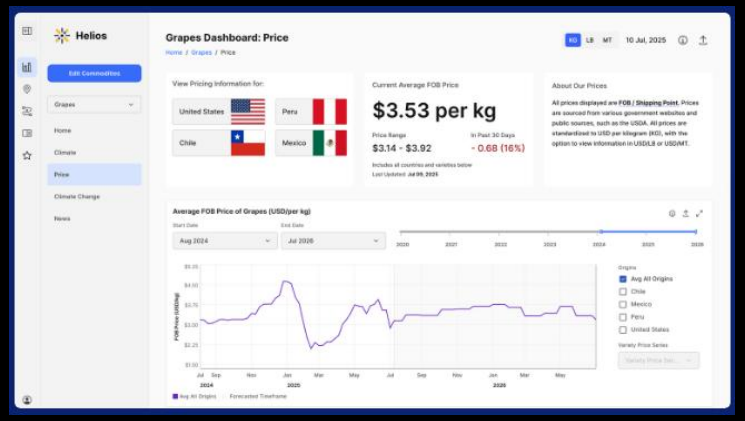
AI is driving autonomy – will reshape productivity across the global economy. As autonomy becomes normal complete industries will be transformed:

- Labour markets
- Financial services
- Internet commerce
- Etc

Can it be globally deflationary and reach abundance?

AI discovery and value chain capabilities are scaling…



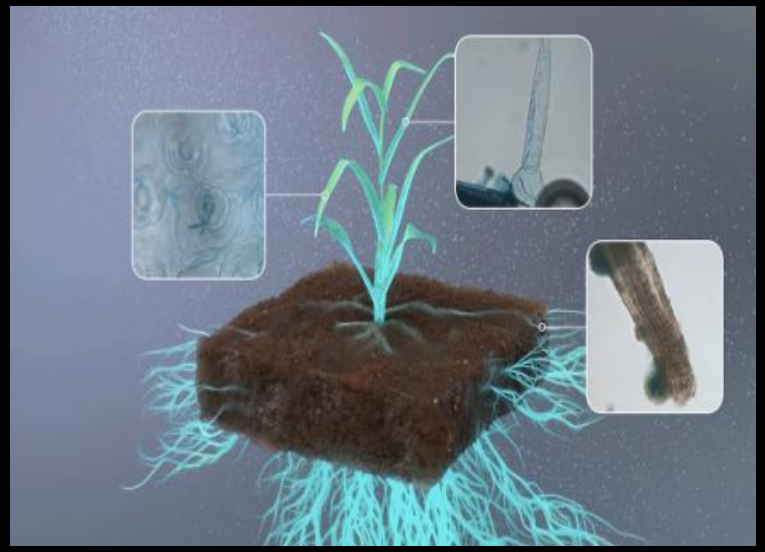


Forager™ – analyses plant genetics, biochemistry and health research to develop human health solutions from plants that possess novel health properties. Science knows 100,000 compounds from plants, which have yielded things like aspirin and metformin – by 2025, Forager™ will have analysed 10 million.

Tastewise – analyses billions of data points from 22 billion social media interactions, 5 million home recipes and 1 million restaurant to find what's trending. Predicts consumer preferences with much greater accuracy than point-of-sale data.

Helios AI – agricultural commodity price forecasts up to 12 months out, explains what is driving the change., provides a breakdown by commodity, region and variety.

Environmental startups targeting global issues…



Azotic – uses **Gluconacetobacter diazotrophicus (bacteria) that enters the plant to fix nitrogen from air – up to 50% of the plants needs (currently used for corn, rice, potatoes, etc), has been used on approx 2m acres. Also supports phosphorus availability, pest management and crop enhancements.**

TRIC Robotics – plans to scale its autonomous robots for specialty crop farming, starting with strawberries—one of the most labour-intensive and pesticide-reliant crops.

Vitivoltaics – Hochschule Geisenheim University

"The main benefit we have observed is faster vine growth," with, "slow and optimal grape maturation" for a better balance between acidity and alcohol, more concentrated fruit aromas, and "an unprecedented range of flavors" in the wines. Hail and frost don't damage the vines, as during these weather events, the panels can be adjusted to a horizontal position, creating a greenhouse effect beneath them. The vines don't suffer drought because the ground cover retains more moisture in summer. All of this contributes to 30 percent higher yields."

Example of new tools on the market in the US…

Varroa mite – the mites are parasites that feed on honeybees and larvae, and cost NZ $39m per year (2020 estimate).

2022 study found that peptidomimetrics (synthetic peptides) were observed to have significant oral toxicity to mites (currently seeking US EPA approval).

GreenLight Biosciences™

Norra – “an effective and long lasting new mode of action for varroa mite”

Example of new transformational capabilities coming…

GreenLight Biosciences™

GreenLight Biosciences submitted 28 Oct 2025 a dossier in the US, EU and Brazil for a RNA based solution to control Grape Powdery Mildew. The product leverages RNA interference (RNAi) to precisely target powdery mildew, offering grape growers a powerful, environmentally friendly alternative to conventional fungicides.

"The submission of this dossier, the first-known RNA-based fungicide, demonstrates our ability to address the full spectrum of crop protection challenges, from insect to fungi to weeds," said Andrey Zarur, CEO of GreenLight Biosciences. "This milestone underscores our commitment to harnessing the power of nature and highlights the strength of our platform to manufacture RNA-based solutions at any scale. This flexibility is key to meeting the diverse needs of growers worldwide and accelerating innovation in crop protection."

Technologies scaling…

Verdant Robotics - reduce costs and inputs – on-farm robotic equipment is starting to become farm ready – 2-3x increased output with 95% less chemicals.

Biodegradable biomass based hydrogel – UT Austin is leading the development of hydrogels for drinkable water creation – and now states agriculture is a target use case. Now generate 14.19 litres of water per kg per day. The research team is now working on scaling production and designing real-world device systems for commercialization, including portable water harvesters, self-sustaining irrigation systems, and emergency drinking water devices.

Reference: "Molecularly Functionalized Biomass Hydrogels for Sustainable Atmospheric Water Harvesting" by Weixin Guan, Yaxuan Zhao, Chuxin Lei, Yuyang Wang, Kai Wu and Guihua Yu, 13 February 2025, *Advanced Materials*. DOI: 10.1002/adma.202420319

Autoagri new on-farm tools: AI powered systems with inter-changeable tools will allow scale and lower costs.

Food system = bioeconomy: examples scaling in NZ

Meat sector

Aroa - a soft-tissue regeneration company that develops, manufactures and distributes medical and surgical products to improve healing in complex wounds and soft tissue reconstruction.

Dairy sector

Quantec - following their discovery of 50+ bioactive whey proteins that are present in pasture fed milk. The bioactive protein creates antimicrobial, antiviral, anti-inflammatory and antioxidant properties discovered led to the development and launch of IDP® (Immune Defense Proteins) and SynaQ® (range of customised bioactive whey proteins tailored for specific application and consumer needs).

Wool sector

Lanaco - produce a range of Standard air filter media designed to suit the widest range of applications. Product range:
+ EcoStatic® offers electrostatic filtration with multiple USDA Certified Biobased Product formulations
+ Alpuro® offers effective grease filtering solutions
+ Custom designed solutions
.

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