

CSIRO

Perspectives on Future Protein Production

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Animal Protein Production – Lead,
in CSIRO's Future Protein Mission

Food and Feed for the Future – OECD Workshop, Lyon
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9.7b



Population
by 2050

-55%

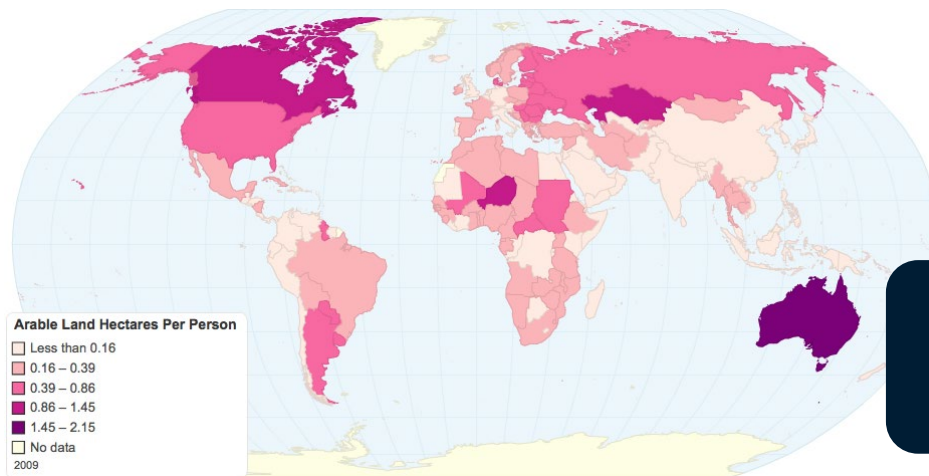


Agricultural land per
capita (1961-2016)

+71%



Food needed
by 2050



**AUS (1.24) vs
SE Asia (0.21)
(2018)**

1 in 3

Australians consciously limiting their meat consumption

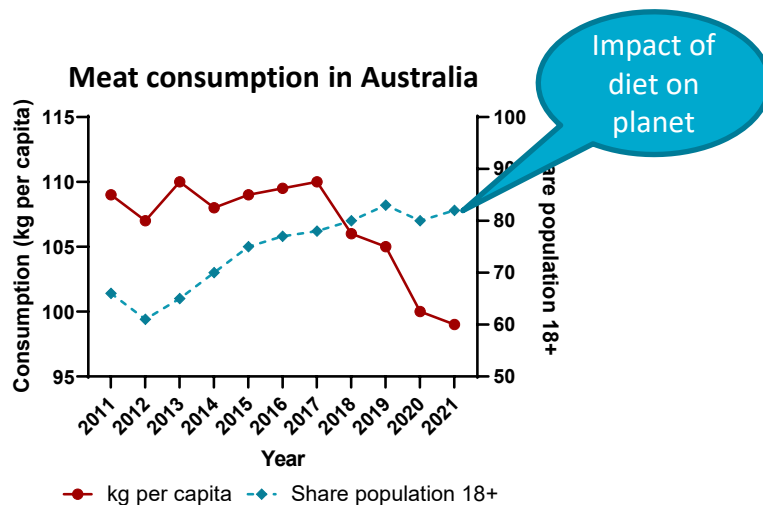
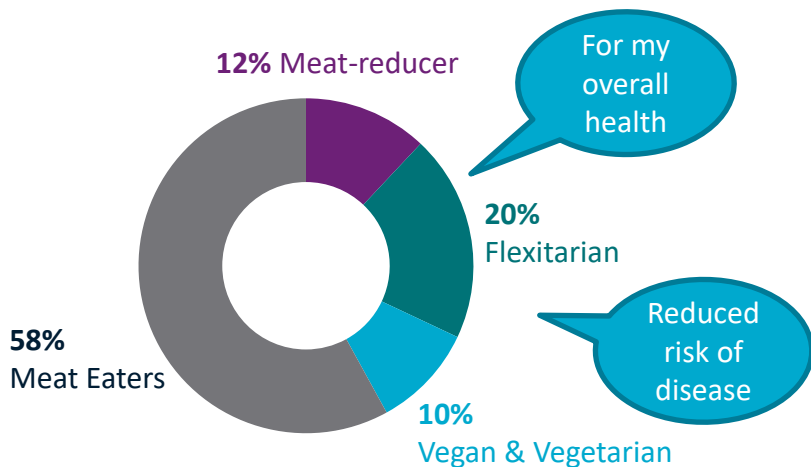
Australians defined as flexitarians has grown by



+20%

~10%

reduction in Australian red meat consumption (2011-2021)



To capture the high growth protein markets to grow Australia's protein industry by \$10b by 2030



Growing protein demand



Changing consumer preferences



Increasing investment & innovation



Plant protein for new markets



Sustainable animal protein production



Novel protein production systems

Animal Protein



Aim:

Protect & grow traditional and valuable agribusinesses

Key activities:

- Sustainable feeds – future feed
- Value adding to all co- and by-products
- Proteins for health: healthy ageing
- New industries – white flesh fish

Plant protein

Aim: Transform commodities to high value products underpinned by nutrition & sustainability

Key activities:

- Improving the grain composition: high protein and free-from crops
- Enhancing sensory attributes & improving functionality
- Health by stealth (bioactives)



Lupin



Soybean



Pigeonpea



Mungbean



Faba bean



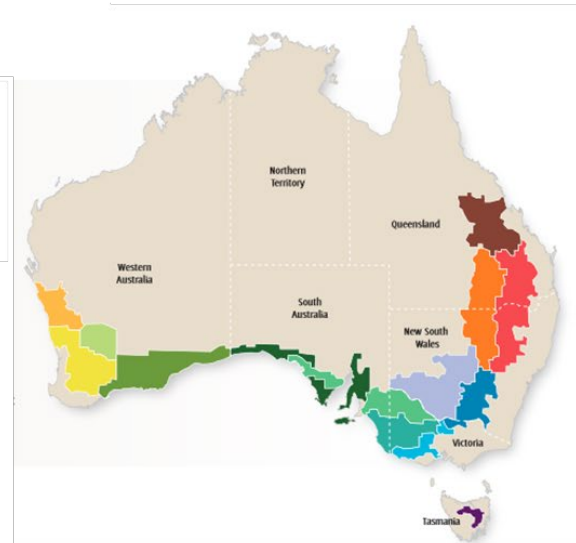
Field pea



Lentil



Chickpea



Novel protein

Aim:

Develop innovative new industries that upcycle no/low-value waste streams into high value protein products

Key activities:

- Repurposing waste
- Co-product industries
- Insect protein production
- Precision fermentation





Australia's National
Science Agency

Protein

A Roadmap for unlocking technology-led growth opportunities for Australia

2022



Size of the prize (2030)

\$13b



Additional technology-led protein market opportunity in Australia

~10000



Additional jobs

A blueprint to guide investments in science, technology and infrastructure initiatives that contribute to the protein industry's:

- productivity and profitability
- sustainability
- regional prosperity
- global competitiveness



Reshaping Australian Food Systems

A Roadmap towards a more sustainable, productive and
resilient future for Australia's food, its environment and people

2023



Driving progress through five system-wide focal areas aligned to SDG



1. Enabling
equitable access
to healthy and
sustainable diets



2. Minimising
waste and
improving
circularity



3. Facilitating
Australia's
transition to net
zero emissions



4. Aligning
resilience with
socioeconomic
and environmental
sustainability



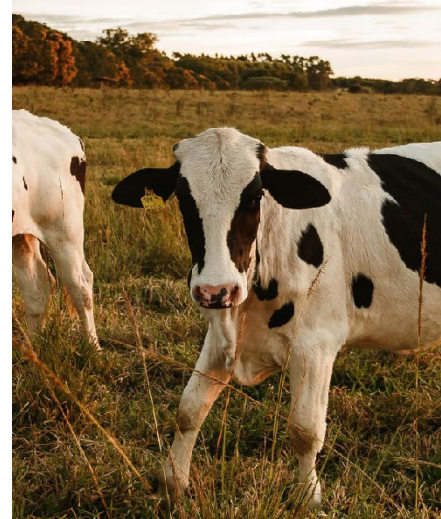
5. Increasing
value and
productivity

Case studies

Animal, Plant and Novel protein ingredients and product innovations

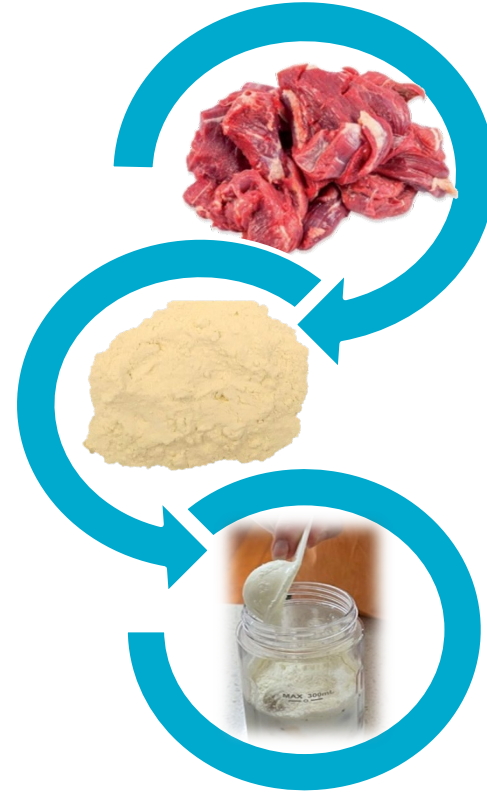
Asparagopsis – FutureFeed

- Small amount of *Asparagopsis* on the dry feed can reduce methane emissions by 80%
- Safe ingredient for ruminants
- Meat quality is unchanged
- CSIRO start-up established in 2020
- Nine licensees globally have begun cultivating and processing *Asparagopsis* seaweed
- To date science is based on beef feedlot and dairy settings
- New R&D on grazing applications



Meat Powder – from lower value meats

- Novel process (platform technology) to transform low value red meat cuts into a hydrolysed beef powder.
- 100% beef powder that is shelf stable, completely soluble and odourless, allergen free, functional, high in micronutrients and is underpinned by Australia's red meat credentials.
- Could be use as an ingredient in protein balls, bars, shakes; protein supplements for aged care/elderly, global populations deficient in protein.
- Currently under consideration for company creation/start-up.



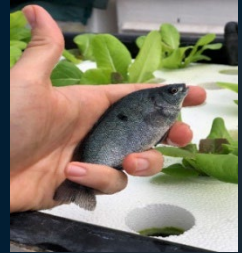
White flesh fish – growing a sustainable industry

Why?

- Australia imports over 100,000 T of white flesh fish per year
- Increase protein production
- Create a long term model for sustainable farming practices

How?

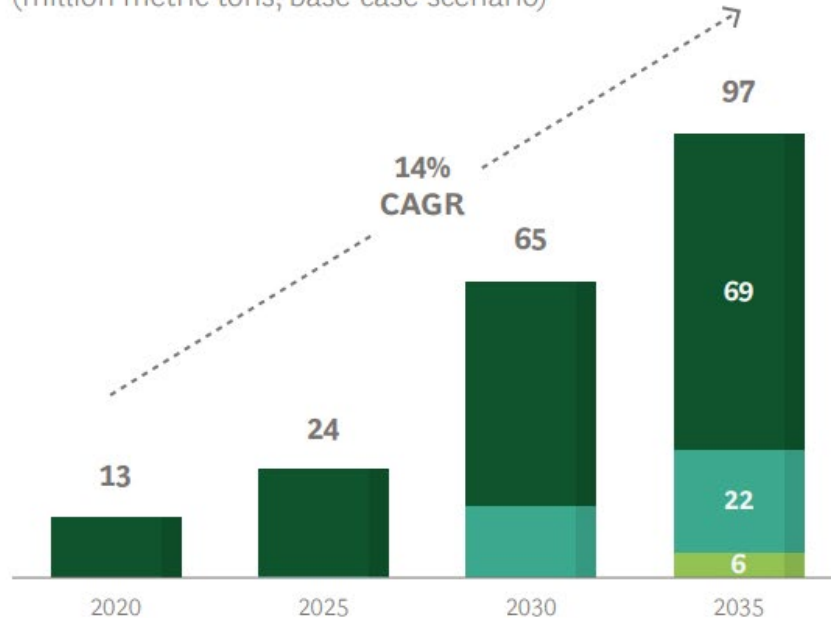
- Developing an industry using *Trachinotus anak*
 - Native to Australia, thrives in captivity, hardy and robust to environmental variables
 - Controlled spawning in captivity, easy larval culture and no cannibalism
 - Fast growth, high fillet yield, high quality flesh
- Aquaponics using jade perch
 - Low trophic + high value crops
 - Green credentials and social license



No aquaculture industry without aquafeed

Alternative/complementary protein growth - ambition

Consumption of alternative proteins by protein source
(million metric tons, base-case scenario)



CAGR	CAGR	CAGR
2020–2025	2025–2030	2030–2035
13%	22%	8%
12%	16%	7%
45%	111%	8%
52% ¹	66%	120%



Plant-based



Microorganism-based

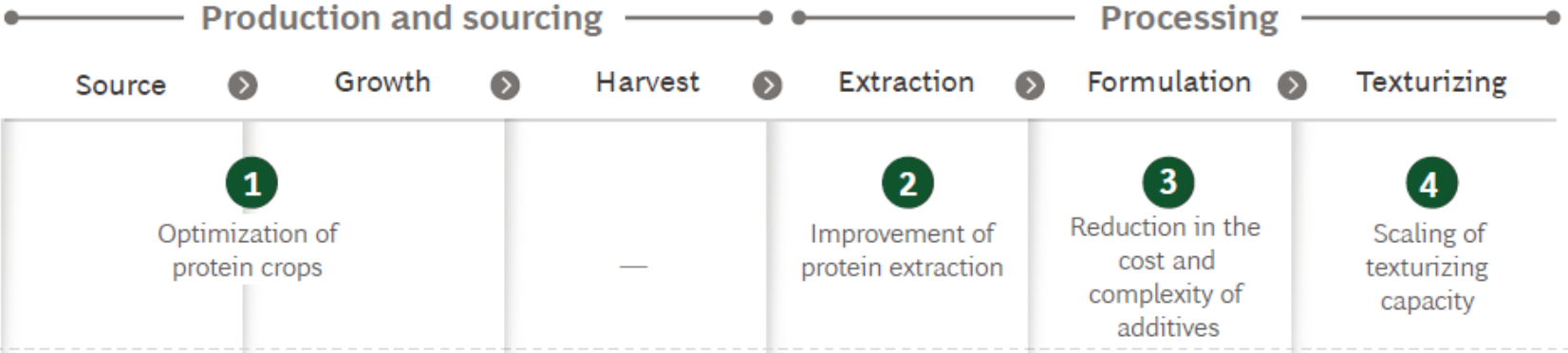


Animal-cell-based

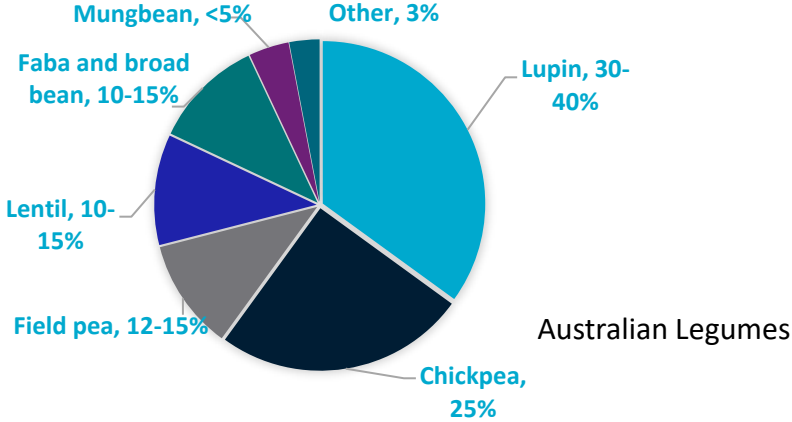
Molecular farming – fast growing

CSIRO

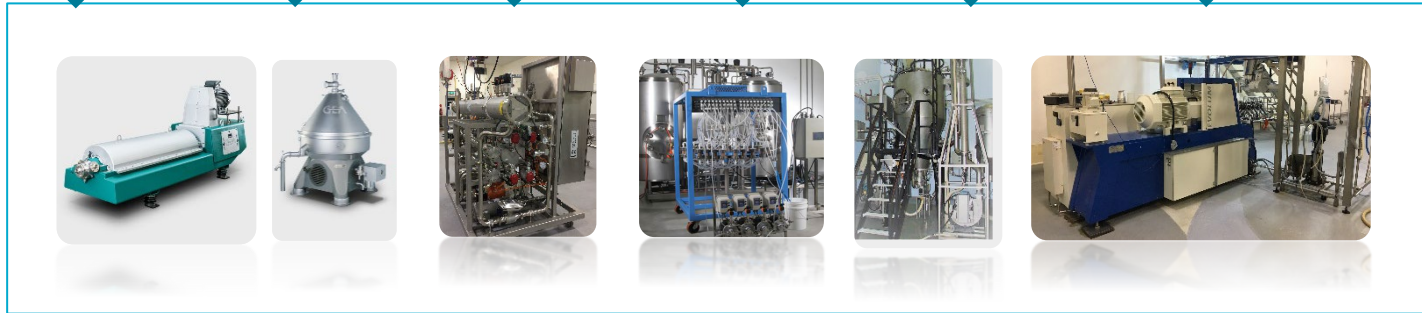
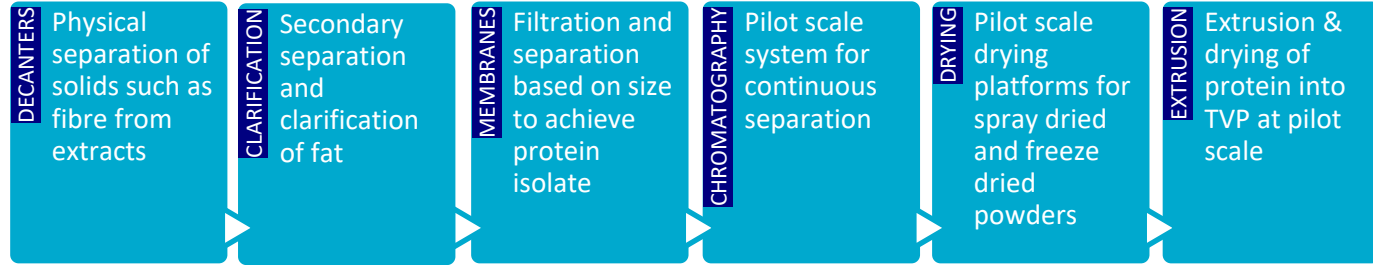
Plant Protein



<https://www.bcg.com/publications/2021/the-benefits-of-plant-based-meats>

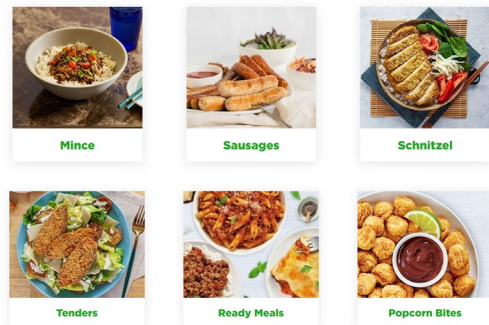


Extraction, Separation, Drying and Extrusion Capability





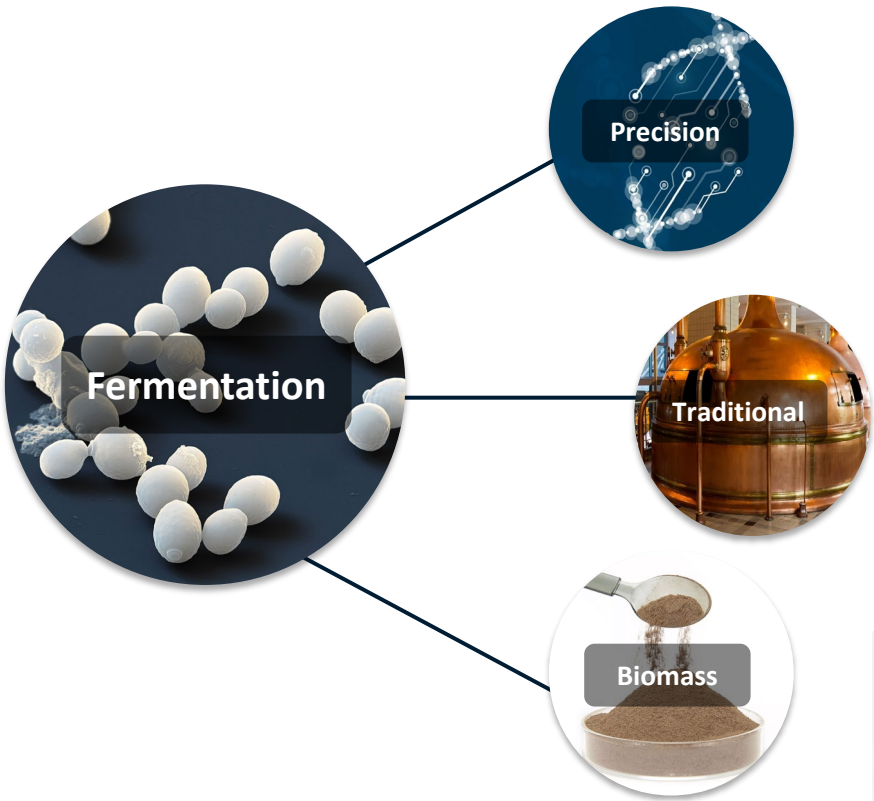
<https://ecos.csiro.au/cracking-lupin-wide-open-sausages-to-high-value-protein-ingredient/>



<https://www.csiro.au/en/work-with-us/funding-programs/SME/CSIRO-Kick-Start/APP>



Food fermentation at a broad glance



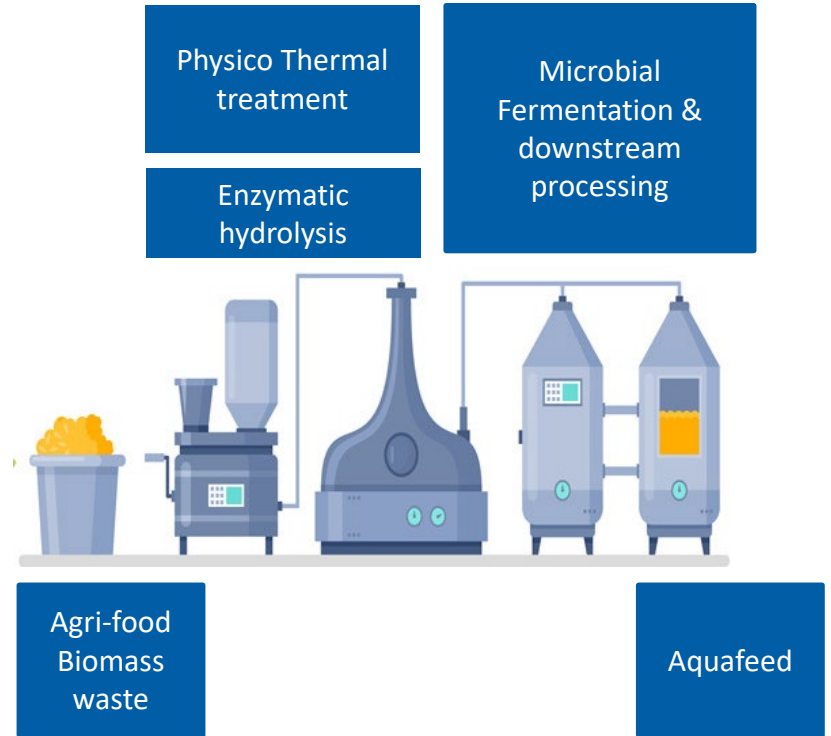
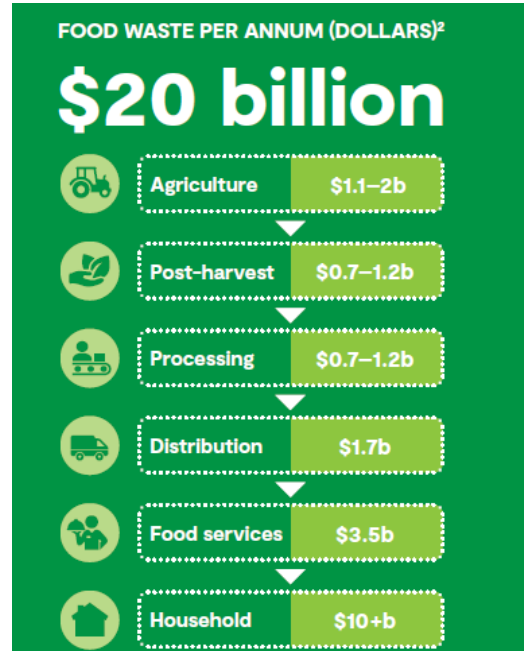
nourish
INGREDIENTS

**Eden
Brew**



CSIRO

Biomass fermentation – valorisation of agri-food waste



Innovation driving complementary choices



Animal-based



Blended



Plant-based



Hybrid



Cultivated products





Thank you

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<https://www.csiro.au/future-protein-mission>