

Towards a Decadal Plan for Australian Nutrition Science

The Decadal Plan for Nutrition Science will be developed by the National Committee for Nutrition of the Australian Academy of Science. Decadal plans are 10-year strategic plans for science disciplines, developed with a view to enabling science to deliver the greatest possible benefit to society. This will be achieved through:

- assessing the current and emerging state of knowledge across the ‘inter-discipline’ of nutrition science
- identifying and setting priorities for the most important societal challenges that *require scientific solutions* for the next decade
- outlining strategic scientific research priorities and goals to achieve those solutions.

The decadal plan for nutrition science seeks to provide a comprehensive strategic analysis of Australia’s nutritional challenges and opportunities, and how nutrition science may coordinate efforts, develop capability, and sustain research infrastructure over the coming years.



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Once finalised, the Australian Academy of Science and the National Committee for Nutrition will continue working with professional associations, policy-makers and other key stakeholders to implement the recommendations of the plan and realise its benefits.

Recommendations from the decadal plan will include mission-directed future science priorities that are identified during consultation. The audience for the document will, to a large extent, be policy-makers and funding agencies.

Background and purpose

Australia's Decadal Plan for nutrition science comes at a time of great—and increasing—global change. Food insecurity and inequity remains a significant regional challenge in some areas and the impact of climate change on agriculture, local food availability and nutrition will require careful management. Preventable non-communicable diseases (NCDs) remain stubbornly persistent throughout the world and the developed world's overweight and obesity pandemic continues. In recognition of these and other challenges, the UN's *Decade of Action on Nutrition*, and several other high level international initiatives are underway.

Concurrently, and perhaps fortunately, the complex and multi-faceted problems posed by our increasingly global human footprint are coupled with rapid scientific and technological progress that brings newfound abilities to tackle these problems. This decadal plan will identify Australian science's contribution towards meeting the manifold challenges that will be encountered in the next decade and beyond.

Specialist knowledge from a broad range of sectors will need to be engaged, co-developed and integrated to meet our

growing nutrition-related challenges. The collective promise of tools such as big data analysis, systems thinking, personalised nutrition, enhanced agriculture and an array of 'omics' technologies present a tantalising hint of a scientifically-enabled future.

But understanding and knowhow are not enough. We must remember that many nutrition-related challenges are non-scientific in nature, and powerfully influence what is achievable in society. Science must be applied to drive food system changes at multiple leverage points, to provide more options, or to enable new solutions to society's problems.

The decadal plan will also consider nutrition science as it applies to humans. It will identify and prioritise topics and issues that, by virtue of our inherently personal and social relationships with foods and diet, are often inextricable from society and public policy.

The plan will recognise that some issues are contested and will not exclude these issues from its scope, but will not extend to policy advocacy. The decadal plan will also consider all levels and types of education as an important foundation for nutrition science knowledge and practice.



Benefits for Australia

Australia enjoys a global reputation for its nutrition science, being one of many areas in which we ‘punch above our weight’. It was also listed as a high growth discipline in the last ERA (2015/16)¹. Coupled to broad policy support, including an intention as noted in *Australia 2030: Prosperity through Innovation*² to ‘ensure Australia continues to be one of the healthiest countries on Earth’, the future of Australia’s nutrition should be looking bright. It is also acknowledged that science, technology and innovation are instrumental in meeting Australia’s rising demand for public services and tackling Australia’s biggest social and environmental challenges, including improving health outcomes. Australia is not traditionally strong, however, in translating our excellent research into innovations that benefit Australian society.

Ensuring Australia is a leader in nutrition science as well as increasing translation and commercialisation of nutrition research will deliver three specific benefits:

- Both our local and international population benefit through informed preventative health approaches which also address specific health outcome inequalities.
- Integration with the Australian agri-food sector has the potential to not only provide nourishing food for Australians, but also to make Australia a preferred global exporter of high quality, nutritious foods with health and economic benefits.
- Nutrition science can support innovation in the health, health technology and medical industries by creating new products and services that bring health and economic benefits such as increased employment, productivity and lower healthcare costs.

Australia has, and needs to strengthen, a vibrant nutrition science community that works towards not only the creation of new knowledge but also fulfilling its potential to bring substantial societal benefits to Australia and Australians.



Images: Hal Gatewood and rawpixel, Unsplash

¹As classified by the 4-digit FoR code: 1111 <http://www.arc.gov.au/era-reports>

²<https://industry.gov.au/Innovation-and-Science-Australia/Documents/Australia-2030-Prosperity-through-Innovation-Full-Report.pdf>

Australia's nutrition future

Nutrition science is experiencing a period of unprecedented change and opportunity on the back of game-changing advances in genomics, molecular and systems biology and other areas. These advances are facilitated by the ability to obtain massive datasets and use new scientific approaches and computational methods to systematise, interrogate, visualise and synthesise 'big' data. When combined with established nutrition science approaches in epidemiology, intervention trials and mechanism of action studies, many of the key challenges in nutrition science appear, for the first time in history, within reach.

Considering the pace of change and the potential benefits to Australia, Australian nutrition science must stay ahead of the curve in:

1. Deriving the cause-and-effect mechanisms underlying observational evidence of the impact of diets on health outcomes, so that targets can be established for food production, supply and consumption.
2. Defining individual and group diet–health relationships that can target dietary advice and tailor food production, supply and consumption.
3. Optimising health and economic benefits from improving health, wellbeing and productivity, and reduced burden of disease, through innovations in nutrition policy, products and services. This will also require new approaches to assessing and quantifying the impact of preventive strategies compared to curative approaches.
4. Integrating systems to deliver multiple benefits across what are typically considered as different systems, such as agriculture, medicine and public health. This will require defining nutrition science in the context of these systems.



Images clockwise: Xavier Teo, Dan Gold, Gustavo Quepon, Arshad Pooloo, Unsplash



To address these and additional challenges, a marked shift in the approach and practice of nutrition science may be required. This will include:

- better integrating nutrition with related disciplinary areas such as genomics, big data analytics, information technology, and environmental and agricultural science
- integrating nutrition training, education and practice with fundamental theory from the biological sciences, including evolutionary and ecological theory, to understand the context of human nutrition in modern political, economic, structural and food environments
- better integrating knowledge across nutrients, foods, meals, diets, and dietary patterns to
- understand diet balance over various timescales rather than single nutrients or commodities, and
- understanding the broader context in which ‘balanced diet’ issues play out—from individual choices to community, commercial, political, economic and ecological contexts.

These and other shifts in the approach and practice of nutrition science are likely to require a number of other more specific changes, including:

- developing the means to identify existing strengths in nutrition and related sciences in near-real time, and to direct resources accordingly
- strengthening nutritional science research capacity within Australia and our region, particularly research that addresses uniquely Australian and regional problems
- boosting nutrition-related education and careers in Australia, including the consolidation of nutrition as an interface between the medical, food, health, agricultural and environmental innovation systems
- highlighting scientific opportunities to integrate nutrition science with the agriculture, health, and medical technology sectors, using food supply and food processing on both supply and demand sides to help solve problems for Australians, and
- effectively and professionally communicating the science of nutrition to all Australians.

The Decadal Plan process

The Decadal Plan for nutrition science in Australia will follow the Australian Academy of Science's established consultative drafting process. This includes opportunities for workshop-based, online and written feedback. It will also benefit considerably from the proceedings of the *2017 Theo Murphy High Flyers Think Tank: Rethinking food and nutrition science in Australia*³.



Image: Rachael Gorjestani, Unsplash

This document is intended to provide background information to workshop participants and to promote discussion in the nutrition science research and practice communities, as well as in other research disciplines. The structured discussions it promotes are not intended to be limited to the specific points described in this document: workshops will highlight omissions, begin prioritising issues, and identify research areas of national and long-term importance.

One approach to capturing the proposed scope of the plan is to address the following topics during workshops:

1. Solutions to nutrition science challenges—from epidemiology to mechanism

- Identify where disconnections exist in nutrition science methodology that prevent generation of data truly representative of dietary intake/nutrition. Are current methodologies (e.g., RCTs) flawed? If so, how? Consider epidemiological studies, human clinical trials and mechanistic (animal) studies.
- Conceive new approaches to assist in designing studies that will provide an accurate determination of the effects of diet on health/wellness and disease (including moving away from prescriptive methods).
- Develop a systems biology approach to characterise nutrition in wellness/health and disease. This would involve integration of biomarkers from gastrointestinal bacteria to host (e.g. from blood, urine and gut microbiota). These would constitute immunomodulatory mediators (immune cell activation, cytokine/chemokine production), metabolites (microbial, host and food-derived), vitamins, hormones and genes etc, quantitated using the 'omics' technologies (metagenomics, transcriptomics, metabolomics, proteomics and others).
- Understand how diet, nutrition and disease can impact upon these mapped profiles (from above).
- Develop new technologies to advance understanding of nutrition science.

³Theo Murphy Think Tank 2018: Rethinking food and nutrition science in Australia.

<https://www.science.org.au/news-and-events/events/think-tanks/rethinking-food-and-nutrition-science/discussion-papers-food-and>



Image source: Shane Rounce, Unsplash

2. Nutrition in context—environmental factors influencing health outcomes

- Map the relevant facets of the environment that influence what people eat. These include networks (e.g., family, friends and peers), settings (e.g., stores, restaurants and fast food outlets, workplace) and sectors (e.g., food industry, marketing, governance).
- Understand how these interact with personal factors (e.g., attitudes, preferences, skills and nutrition knowledge) in different groupings (e.g., cultural, socioeconomic, age groups, genotypes, health status) to influence diet and health.
- Identify, rank and prioritise leverage points through which interventions could affect outcomes.
- Characterise the achievable routes through which effective interventions can be achieved.

3. Individual responses to foods and diets—towards personalised nutrition

- Develop a white paper on the terminology, scope, current and future science.
- Consider both personalisation for wellness (prevention) as well as clinical applications.
- Include personalisation based on genotype and epigenomics, phenotype (clinical, behavioural and physical) as well as envirotypes.
- Examine business models and their respective strengths and weaknesses in delivering positive health and economic outcomes.
- Explore the ethical and legal challenges of personalised nutrition, especially where genotype is concerned.
- Put into context how we rationalise public health and personalised health paradigms where they may appear diametrically opposed.

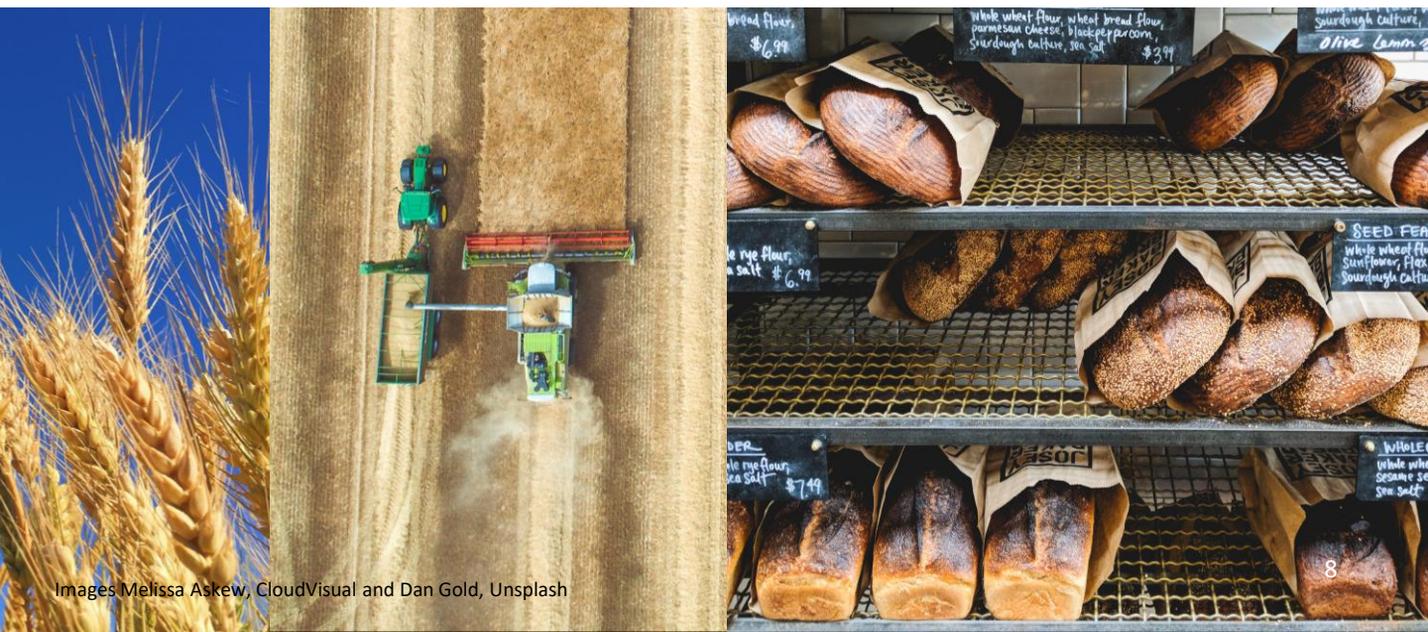
4. Education and training—skills for future challenges

- Supporting a professional workforce.
 - Embracing and communicating complexity.
 - Competency-based education.
- Further details in Attachment 1.

Workshop questions

Recommendations will be developed during the review and consultation phases and be refined during further consultation. They are likely to be relevant across several if not all topics. Concepts that may yield recommendations will be raised as open questions during the consultation workshops. These include but are not limited to:

- Could a curated **knowledge hub** of nutritional information relevant to local, national and global needs deliver greater value from research investments? What role could it play in ongoing data gathering to ensure best quality population health and public policy modelling? Could it support a breakthrough in positioning nutrition as a scientifically defensible bridge between agriculture and medicine?
- Despite widespread but clichéd acceptance that ‘prevention is better than the cure’, is it possible to develop a system in which the **benefits from prevention** are considered alongside the benefits of intervention and treatment of disease? Should the multiple benefits of wellness be quantified in such a way as to allow resources to follow where the benefits and costs are accrued?
- What changes are required, and where, to ensure that nutrition science secures appropriate **research, development and training resources** commensurate with a fair consideration of prevention, intervention and treatment of disease?
- Considering the wholesale changes to society in the coming decades, largely driven by technology and ubiquitous connectivity, what does the next generation, or two or three generations, of **education and training** actually look like in nutrition research and practice?
- What are the drivers, barriers, benefits and opportunities associated with **improving equity and diversity** in nutrition theory and practice? Which of these are specific to nutrition?
- What role can each part of the nutrition sector play in achieving a credible, **consistent, professional, and evidence-based voice for nutrition** in dialogues with governments?



Next steps

Consultation workshops are an important source of information regarding the research and practice community's views, hopes and vision for the future.

Attendance is explicitly not limited to researchers, nutritionists or dietitians: anyone with an interest or potential interest is welcome to participate, especially from related disciplines and professions such as agriculture and medicine.

The consultation process will run until September. The Australian Academy of Science website will show details as they become available.

People who are not able to attend in person may still fill out an online survey, which will be developed based on workshop feedback and considered alongside other community consultation results.

More information on this and other Decadal Plans for science can be found on the Academy of Science website, at: <https://www.science.org.au/nutrition>.



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