



Parliamentary Inquiry: Food Security in Australia

I. Introduction to the submission

Sydney, December 7, 2022

To the House of Representatives Standing Committee on Agriculture

Dear members of the Committee:

In the following, please find a submission to the parliamentary inquiry into Food Security in Australia. We thank you for giving us the opportunity to contribute to this important initiative. All authors of this document work as academics in the UNSW food science program.

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II. Body of the submission

1. Global Food Security is vulnerable

The UN Food and Agricultural Organization (FAO) defines food security as *“Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”* (1). Almost every word in this definition is of meaning and yet, three words, sufficient, safe, and nutritious stick out.

An equally important definition has been made by the FAO for food systems: *“Food systems (FS) encompass the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption, and disposal of food products that originate from agriculture, forestry or fisheries, and parts of the broader economic, societal, and natural environments in which they are embedded”* (2).

Food insecurity is the antonym of food security, and extreme food insecurity is equivalent to hunger. At its core, food (in)security is being addressed by UN sustainable development goal (SDG) N°2 “zero hunger”. However, given the various interconnectivities between sectors and societies it is evident that most of the SDGs are linked through the human need to procure, produce and to consume food. In fact, by mapping the drivers necessary to achieve all the UN-SDGs it is apparent that aspects of agri-food technology and nutrition science are behind each of the 17 goals.

Food security critically depends upon the specifics of the food system in each geography and in turn any food system is strongly determined by all aspects linked with production, processing, and distribution of food.

Yet, several factors are in the way of providing physical and economic access to sufficient, safe, and nutritious food at all times:

- Access to food and nutrition are dominant enablers for public health and are dependent upon social status in Australia (3,4).
- The purchasing power and thus affordability to enable consumption of food varies across social classes.
- Access to healthy nutrition is under control of the private sector (5).
- Global events such as war and pandemics influence global commodity prices – with impact on the Australian market.
- Climate change, exacerbated by high intensity animal farming and by food waste, will have an impact on food security. Both, droughts & floods are on the rise in Australia.

A much-quoted numbers game illustrates one aspect of the global threat to food security: By 2050, at an estimated global population of 9-10 billion people, we need to increase our food productivity by nearly 70%. To this end no resources are available to address this challenge (6).

2. Australian National production, consumption, and export of food.

Food security in Australia is of interest because a significant amount of food is being exported. Australia is exporting more food than it imports. At first glance this implies a built-in availability of food and thus a high level of intrinsic food security.

However, consumers are looking for food products that represent a value-added proposition made from the key commodities. In this context it is alarming that Australia's manufacturing capacity seems at an all-time low as suggested by recent OECD data and the derived reports (7,8).

So far, Australia continues to show a significant level of self-sufficiency with respect to primary production. At the same time, throughout the country consumer concerns are growing around food sustainability, environmental footprints, biosecurity risks and climate change.

As put forward with this submission, the Australian food system is vulnerable with ample opportunities for improvement. Remarkably, these opportunities are distributed across primary, secondary, and tertiary sectors of the economy for developments in multiple areas: disease prevention, renewable energy, sustainable food practices, higher yield crops, superior food safety technologies and traceability.

In Australia over 90% of the fruit, vegetables, meat, milk, and eggs sold are domestically produced. Still, over half of Australia's agricultural produce is exported. Our gross value of agricultural food production is forecast at \$85 billion for 2022-23 (9,10) and our agricultural exports are forecast at \$72 billion, reflecting the recent increase in world food prices.

The value of Australian crop exports has nearly doubled over the past decade. In 2012-13, food produced by Australian farms and fisheries was valued at \$42.8 billion (grains and oilseeds contributing 33%, meat 31%, fruit and vegetables 18%, milk 10% and seafood 5%).

A significant proportion of Australian total food export value is minimally transformed. While an ongoing discussion about exporting more processed food to create increased economic value continues, it is evident that consumers and markets are looking for quality and sustainability. A recent *ABARES insights* report makes the point that "... *future opportunities across the value chain will rest on the ability to competitively trade on product attributes*"(11).

Potential risks and threats for Australian food security arise from impaired global growing conditions, high costs of gas, fertiliser, and energy, which have all contributed to increasing food and commodity prices. The monthly Consumer Price Index (CPI) indicator for food and non-alcoholic beverages rose 8.9 percent in the year to October 2022, according to the Australian Bureau of Statistics (ABS)(12).

Another risk factor might be biosecurity issues. An outbreak of lumpy skin disease or foot and mouth disease could cost the economy more than \$80 billion, according to the Australian Bureau of Agricultural and Resource Economics and Sciences (13).

3. The impact of supply chain distribution on the cost and availability of food.

Australia exports large quantities of raw agricultural commodities to have them processed overseas. A lot of this food is imported back to Australia as the final product. Although raw product exports have been the main driver for domestic value growth, over-reliance on this process leads to high supply chain costs.

Moreover, food is less affordable in rural and remote areas owing to added transport and logistics costs. Communities in remote areas where food outlets are sparse and not well linked to public transport are at risk of food insecurity.

A cooperative approach by the public and the private sectors is required to improve food security and ensure access to remote communities.

4. The potential opportunities and threats of climate change on food production in Australia.

Food systems and the Climate are mutually dependent, and a stable food system is reliant on a stable climate system. Consensus is emerging that in particular the agricultural and livestock elements of global food systems are major culprits in climate change with 14.5% of all anthropogenic greenhouse gas emissions originating from livestock and 18.4% being attributed to agriculture in general (14,15).

Consensus is equally emerging that man-made climate change is affecting Australia with both severe droughts and severe floodings leading to significant impact on supply chains and food distribution across the country (16).

With 30% of food being wasted globally a direct metric is available of the food systems contribution to climate change without any benefit whatsoever (17).

With a view on individual and community driven behaviours and practises it is evident that a food insecure person or group of people will not care about climate protecting steps as compared to a similar person or group who are living under full food security.

5. Role of the public sector

Universities, Research institutions such as the CSIRO, think tanks and NGOs share a responsibility to conduct research, to educate and to inform the public. With food security as a key element of the public debate, many related topics are integrated, ranging from climate change, economic growth, public health, and social stability.

The crucial role of research and innovation in achieving food security has been recognized by the UN (18). Key areas of research include agri-food productivity to increase food availability,

enabling technologies in food processing to improve food accessibility, stability, nutrition, and utilisation.

Health is a key aspect in the debate on food security and this includes personal health, planetary health, and a healthy economy. Thus, food insecurity is associated with a loss of health along these three coordinates.

Food insecurity is linked with malnutrition in a way that paradoxically can lead to overconsumption of calorie dense foods without much nutritional value. This creates a growing trend of overweight and obesity with the associated health problems (19–21) The problem often is exacerbated in lower social economic groups. Foods accessible to this social economical group are often highly processed, energy dense (high in fat and easily digestible carbohydrates) and designed for convenience and sensory appeal.

It is crucial that national nutrition policies and regulations encourage the development of food technologies that enable production of foods not only fresh and sensorially attractive, but also nutrient dense (defined as foods that have high nutrient content per calorie), low cost and accessible to all population groups.

Reducing post-harvest food loss and wastage is an efficient and sustainable way of improving food supply without increasing the demand in food production. Estimated food wastage is 280-300 kg/year for Europe and North America. This represents about 30% of the food production (22). The Australian situation is similar and the government is aware of these figures (23,24). Most of the wastage occurs at the consumption stage. Consumer education as well as innovation in food science and technology can play a significant role in reducing food waste.

6. Actionable steps to strengthen Food Security in Australia

The solving of societal issues such as food security mandates both *technology innovation* and *policy innovation* alike. In the following, several feasible and impactful actions are listed to ameliorate existing threats to Australian food security both with a short term and with a long-term vision.

Over the past three years UNSW significantly enhanced their food program in terms of scope, infrastructure, and competence distribution. The investment is reflected in educational and research activities alike.

Policy innovation:

- A public debate on strengthening food security, linked with the creation of a tangible strategy and relevant policies is needed and the lack thereof is visible especially in times of crises (25–27).
- Incentivise local food manufacturing for Australian SMEs, but also for overseas multinational companies.
- Strengthen Food and Nutrition educational programs at high schools and universities.

Technology innovation (focus on UNSW):

- Various initiatives have already been incorporated, such as the Future Food Systems Cooperative Research Centre, which has been created in 2019 to drive innovation, growth, and resilience in Australia's agri-food sector (28). The CRC aims to provide smart, sustainable solutions to key sector challenges through industry-led collaboration in areas such as developing regional food clusters, technologies for protected cropping including automation, and added value food products (29). The CRC comprises six leading universities; government entities; peak industry bodies; and 40-plus large and small businesses from across Australia and the world, funded by strategic partners and the Australian Government through its CRC Program. A detailed listing of projects and scope is available on the CRC website (28).
- Research on alternative protein supply (alt-protein) is a key element in several Australian research institutions to drive a more sustainable food system. At UNSW an ambitious research program on cellular agriculture is being developed. The program has been reverse-engineered with significant scientific and commercial expertise to create and grow the industry and a sustained value chain for this sector in Australia (30).
- Novel fermentation technologies can transform food processing waste and by-products into edible, nutrient rich and healthy foods, or ingredients. 3D printing technology offers the opportunity to prepare customised foods of these materials with specific nutrient requirements.
- Technology to monitor food safety during transport: Food products are susceptible to food safety risks, and their quality and shelf life are dependent on environmental control, including temperature and humidity. Development of technologies, such as time-temperature indicators and temperature monitoring technology, food sensors, or active and intelligent packaging will help to keep food safe along the journey.
- Technology to keep food safe for a longer time: Isochoric freezing preserves food without turning it to solid ice. Without ice crystal formation, food will last longer and taste better.
- Current food preservation technologies such as drying, thermal treatment, low temperature storage, fermentation and packaging contribute to reduced food loss. Still, there is room for improvement, e.g., through combination with innovations in artificial intelligence, material science and advanced sensing areas. Research and innovation in non-thermal processing such as high pressure or cold plasma can produce foods that are fresher at reduced loss of micronutrients. New extraction technologies such as ultrasound or supercritical fluids improve the extraction efficiency and recovery of nutrients from by-product and waste at the food manufacturing stage.

III. References

1. Policy Brief Changing Policy Concepts of Food Security. (2006) Available at: <http://www.foodsecinfoaction.org/> [Accessed December 2, 2022]
2. Sustainable food systems Concept and framework WHAT IS A SUSTAINABLE FOOD SYSTEM? WHY TAKE A FOOD SYSTEMS APPROACH? CHANGING FOOD SYSTEMS.
3. Mather T, Banks E, Joshy G, Bauman A, Phongsavan P, Korda RJ. Variation in health inequalities according to measures of socioeconomic status and age. *Aust NZ J Public Health* (2014) **38**:436–440. doi:10.1111/1753-6405.12239
4. Health across socioeconomic groups - Australian Institute of Health and Welfare. Available at: <https://www.aihw.gov.au/reports/australias-health/health-across-socioeconomic-groups> [Accessed November 27, 2022]
5. ATNI independent impact review – Access to Nutrition. Available at: <https://accesstonutrition.org/news/atni-goes-through-an-independent-impact-review/> [Accessed November 27, 2022]
6. Allison DB, Bassaganya-Riera J, Burlingame B, Brown AW, le Coutre J, Dickson SL, van Eden W, Garssen J, Hontecillas R, Khoo CSH, et al. Goals in Nutrition Science 2015–2020. *Front Nutr* (2015) **2**:26. doi:10.3389/fnut.2015.00026
7. National Press Club address: Building the economy for the future | Ministers for the Department of Industry, Science and Resources. Available at: <https://www.minister.industry.gov.au/ministers/husc/speeches/national-press-club-address-building-economy-future> [Accessed December 3, 2022]
8. Stanford J. A Fair Share for Australian Manufacturing A Fair Share for Australian Manufacturing: Manufacturing Renewal for the Post-COVID Economy. (2020) Available at: <https://www.tai.org.au> [Accessed December 3, 2022]
9. Agricultural overview: December quarter 2022 - DAFF. Available at: <https://www.agriculture.gov.au/abares/research-topics/agricultural-outlook/agriculture-overview#gross-value-of-production-nears-another-record> [Accessed December 6, 2022]
10. Record agricultural exports defy disruptions - DAFF. Available at: <https://www.agriculture.gov.au/abares/news/record-agricultural-exports-defy-disruptions> [Accessed December 2, 2022]
11. Greenville J, Duver A, Bruce M. Value creation in Australia through agricultural exports: Playing to advantages.
12. Monthly Consumer Price Index Indicator, October 2022 | Australian Bureau of Statistics. Available at: <https://www.abs.gov.au/statistics/economy/price-indexes-and-inflation/monthly-consumer-price-index-indicator/latest-release> [Accessed December 7, 2022]
13. FMD/LSD impacts on the Australian red meat industry – your questions answered | Meat & Livestock Australia. Available at: <https://www.mla.com.au/research-and-development/animal-health-welfare-and-biosecurity/fmd-lsd-impacts-on-the-australian-red-meat-industry--your-questions-answered/> [Accessed December 7, 2022]
14. FAO - News Article: Key facts and findings. Available at: <https://www.fao.org/news/story/en/item/197623/icode/> [Accessed December 4, 2022]
15. Emissions by sector - Our World in Data. Available at: <https://ourworldindata.org/emissions-by-sector> [Accessed December 4, 2022]
16. Bartos S. IMPACTS OF CLIMATE CHANGE ON OUR FOOD SUPPLY Fork in the Road A report on current and growing risks and vulnerabilities in Australia's food supply chain arising from climate change. (2022)
17. Conrad Z, Niles MT, Neher DA, Roy ED, Tichenor NE, Jahns L. Relationship between food waste,

- diet quality, and environmental sustainability. *PLoS One* (2018) **13**: doi:10.1371/JOURNAL.PONE.0195405
18. Unctad. THE ROLE OF SCIENCE, TECHNOLOGY AND INNOVATION IN ENSURING FOOD SECURITY BY 2030. (2030)
 19. Fuglie K, Wiebe K, Sulser TB, Cenacchi N, Willenbockel D. Multidimensional impacts from international agricultural research: Implications for research priorities. *Front Sustain Food Syst* (2022) **6**:523. doi:10.3389/FSUFS.2022.1031562/BIBTEX
 20. Obesity, malnutrition and food insecurity: what are the solutions? - EIT Food. Available at: <https://www.eitfood.eu/blog/obesity-malnutrition-and-food-insecurity-what-are-the-solutions> [Accessed December 5, 2022]
 21. Food and Agriculture Organization of the United Nations, International Fund for Agricultural Development, UNICEF, World Food Programme, World Health Organization. The state of food security and nutrition in the world 2020 : transforming food systems for affordable healthy diets.287.
 22. Gustavsson J, Cederberg C, Sonesson U, Meybeck A, van Otterdijk R. Global food losses and food waste. in *Interpack 2011* (Düsseldorf). Available at: <http://www.fao.org/docrep/014/mb060e/mb060e.pdf>
 23. FIAL NFWS Feasibility Study Report_FINAL.pdf - Zoho WorkDrive. Available at: <https://workdrive.zohopublic.com.au/external/06152b9ff5971843391f39fc4d32a847e56fb907c167a4a645887b0a4bc43000?state=nsw-act> [Accessed December 7, 2022]
 24. Tackling Australia's food waste - DCCEEW. Available at: <https://www.dcceew.gov.au/environment/protection/waste/food-waste> [Accessed December 5, 2022]
 25. Food security and the national food security strategy. Available at: <https://www.foodbank.org.au/national-food-security-strategy/?state=nsw-act> [Accessed December 5, 2022]
 26. Bowden M. Child Family Community Australia Discovering what works for families Understanding food insecurity in Australia. (2020)
 27. Godrich SL, Barbour L, Lindberg R. Problems, policy and politics – perspectives of public health leaders on food insecurity and human rights in Australia. *BMC Public Health* (2021) **21**:1–12. doi:10.1186/S12889-021-11188-8/TABLES/3
 28. Home - Future Food Systems. Available at: <https://www.futurefoodsystems.com.au/> [Accessed December 5, 2022]
 29. Scientists at Future of Food Summit say large corporations need to invest in protected cropping - ABC News. Available at: <https://www.abc.net.au/news/rural/2022-12-02/protected-cropping-challenges-agriculture-australia-food-future/101725972> [Accessed December 6, 2022]
 30. Dolgin E. Will cell-based meat ever be a dinner staple? *Nature* (2020) **588**:S64–S67. doi:10.1038/d41586-020-03448-1