

MELBOURNE'S FOOD FUTURE

Planning a resilient city foodbowl

A Foodprint Melbourne Report

November 2016

Funder

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Table of Contents

1	Executive summary	2
2	Introduction	4
3	Resilience	8
	3.1 Resilient Melbourne	8
	3.2 Risks to global and national food supply	14
	3.3 A resilient food future for Melbourne	20
4	Melbourne's foodbowl	24
	4.1 Capacity of Melbourne's foodbowl to feed the city	25
	4.2 Economic contribution of Melbourne's foodbowl	28
	4.3 Growing Melbourne's regional food economy	32
5	Risks to Melbourne's foodbowl	38
	5.1 Loss of farmland	39
	5.2 Who's going to farm?	45
	5.3 Water scarcity	49
	5.4 Food waste	52
6	A resilient city foodbowl for Melbourne	54
	6.1 Vision	55
	6.2 An integrated policy framework	58
	6.3 Potential policy approaches	60
7	Opportunities and challenges	94
	7.1 Research challenges	95
	7.2 Opportunities for further research	98
8	Conclusion	100



SECTION 1

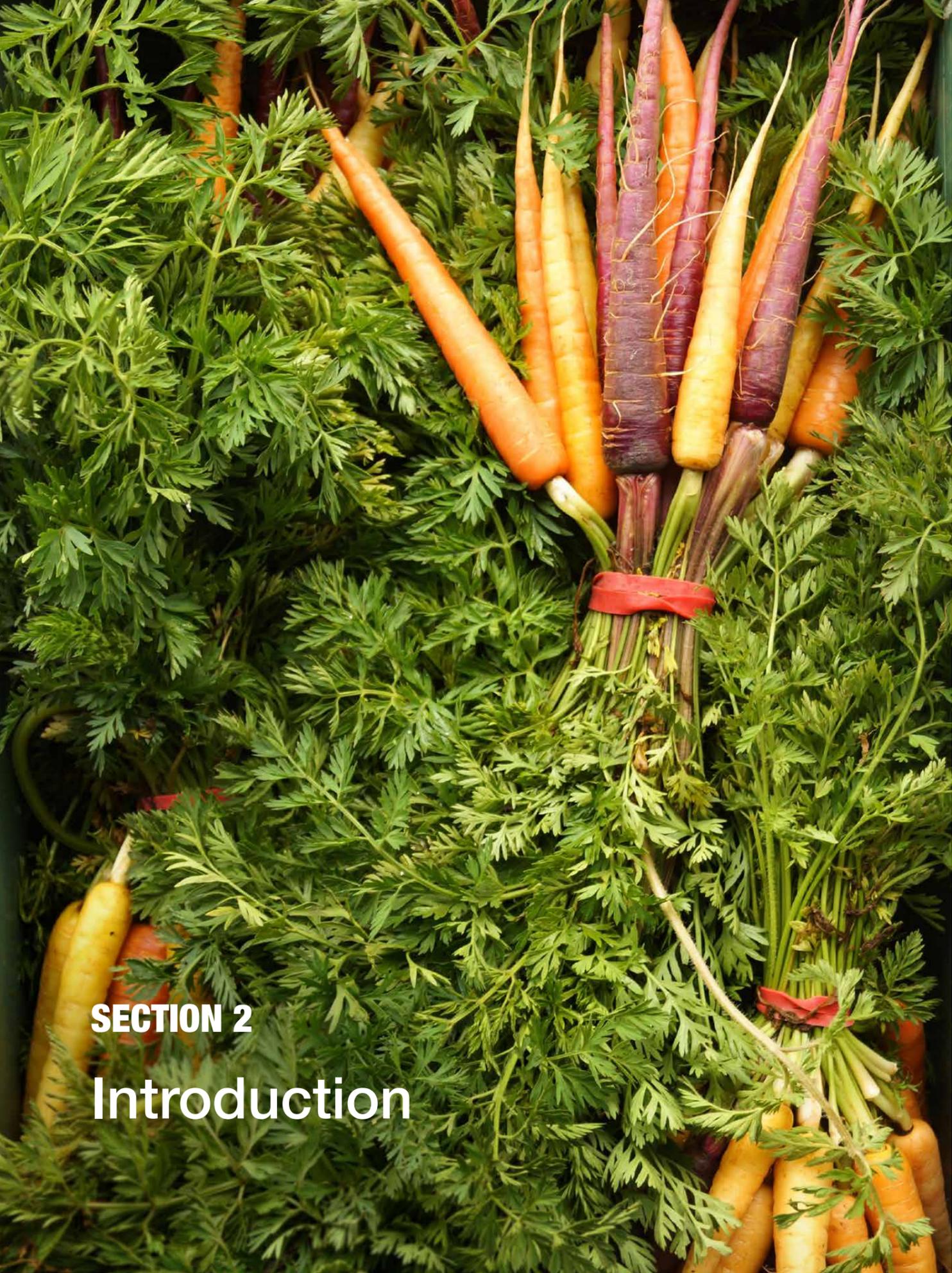
Executive summary

Melbourne is surrounded by a highly productive foodbowl that currently grows a wide variety of fresh foods, but it faces challenges

- Melbourne's foodbowl grows 47% of the vegetables produced in Victoria and has the capacity to meet around 41% of Melbourne's total food needs
- As Melbourne grows to a population of 7-8 million people by 2050, it will need **at least 60% more food**
- If the city's footprint continues to grow as it has in the past, the capacity of Melbourne's foodbowl to meet the city's food needs could fall to around 18% by 2050, due to population growth and urban sprawl
- Loss of production in the foodbowl is likely to contribute to **higher food prices**
- Melbourne's foodbowl contributes **\$2.45 billion per annum** to Melbourne's regional economy and **21,000 full time equivalent jobs**
- Melbourne's food supply faces **future challenges from the impacts of climate change**, including water scarcity and extreme weather events
- **Other major Australian state capitals** also have productive foodbowls that contribute to fresh food supplies, but they are all **under similar pressure from** population growth and urban expansion. They are unlikely to be able to meet future deficits in Melbourne's food needs

Melbourne's foodbowl is an important building block in a resilient and sustainable food future for the city

- Ensuring a resilient food supply for Melbourne requires a **precautionary planning approach** that retains – or strengthens – the capacity of the city's foodbowl
- **The loss of Melbourne's foodbowl is not inevitable** as the city grows. If growth on the city fringe can be limited to existing growth corridors and strong targets are set for urban infill and increased urban density, the impact on the city's foodbowl can be reduced
- Melbourne can **plan for a resilient city foodbowl** that provides healthy food for a growing population, promotes a vibrant regional food economy and acts as a buffer against future food system shocks
- Increased investment in delivery of recycled water from water treatment plants could create **'drought-proof' areas of food production**
- A **'joined up' policy framework** is required to plan for a resilient city foodbowl. Policy is needed to protect farmland, increase water access, reduce and reuse food waste, strengthen the regional food economy and attract farmers to farm in the city's foodbowl



SECTION 2

Introduction

The area surrounding the city of Melbourne has long been a rich source of food. The peoples of the Kulin Nation skilfully managed the abundant resources of the place now known as 'Melbourne' for tens of thousands of years, living on the diverse, seasonal food supply.¹ Europeans introduced vegetable gardens and fruit orchards, and in 1839 the city established its first produce market. Market gardens grew up along the 'sand belt' to the south of the city, and orchards and dairy pastures to the east.² The city fringe was established as an important foodbowl providing fresh food for the growing population. Melbourne was virtually self-sufficient in vegetables until the Second World War³, but by the 1950s, rapid post-war expansion was pushing the market gardens further out of the city and displacing the city's farmland.⁴

At least 60% more food is likely to be needed by 2050 to feed a population of over 7 million people, but there will be less land available to grow food.

Melbourne's city foodbowl is still an important source of fresh food.⁵ However, as Melbourne continues its rapid growth, its foodbowl is put at risk. Melbourne is the fastest growing city in Australia⁶, and is predicted to overtake Sydney to become Australia's largest city by 2061.⁷ At least 60% more food is likely to be needed by 2050 to feed a population of over 7 million people, but there will be less land available to grow food. This dynamic of increasing demand for food and decreasing supply is likely to lead to rising food prices.⁸

Melbourne's foodbowl is particularly important for production of fresh vegetables, which contribute to the health of the city's population. Only 6% of Victorians consume enough vegetables⁹ and inadequate fruit and vegetable intake is linked to overweight and obesity, and to a number of chronic diseases.¹⁰ Almost half of the vegetables produced in Victoria currently grow in Melbourne's foodbowl.¹¹ Future price increases of fruit and vegetables are likely to further reduce consumption, with impacts on population health. The impacts are likely to be felt most by vulnerable population groups that experience high rates of food insecurity.¹² Food affordability is a key factor alongside housing affordability in planning for a fair and resilient city.

1 City of Port Phillip. Spirit: An Aboriginal resource primer.

2 Cole, C. (1980) Melbourne markets 1841-1979: The story of the fruit and vegetable markets in the city of Melbourne.

3 Harcourt, J. (1939) How Melbourne gets its vegetables. The Argus 6 May 1939.

4 Greenlees, D. (1950) Wanted: a vegetable plan. The Argus 24 September 1951.

5 Sheridan, J., Larsen, K. and Carey, R. (2015) Melbourne's foodbowl: now and at 7 million. Victorian Eco-Innovation Lab, The University of Melbourne.

6 ABS (2016a) Regional Population Growth Australia 2014-15. Canberra: Australian Bureau of Statistics.

7 Department of Infrastructure and Regional Development (2015) State of Australian Cities 2014-2015: Progress in Australian Regions. Canberra: Department of Infrastructure and Regional Development.

8 Deloitte Access Economics (2016) The economic contribution of Melbourne's foodbowl: A report for the Foodprint Melbourne project, University of Melbourne. Melbourne: Deloitte Access Economics.

9 Department of Health and Human Services (2016) Victorian Population Health Survey 2014: Modifiable risk factors contributing to chronic disease in Victoria. Melbourne: Department of Health and Human Services.

10 Friel, S., Hattersley, L. and Ford, L. (2015) Evidence review: Addressing the social determinants of inequalities in healthy eating. Melbourne: VicHealth.

11 Sheridan, J., Larsen, K. and Carey, R. (2015) As above.

12 Lindberg, R., Lawrence, M., Gold, L., Friel, S. and Pegram, O. (2015) Food insecurity in Australia: Implications for general practitioners. Australian Family Physician 44(11): 859-862

The loss of Melbourne's foodbowl is not inevitable as the city grows.

The city also faces other pressures on its food supply, particularly from climate change, which is likely to lead to more frequent and severe droughts, storms and floods, and more frequent disruptions to food supply.¹³ This is likely to place additional pressure on food prices.¹⁴

A resilient food supply requires food from local, national and global sources. Indeed, the majority of Melbourne's food needs are met from sources outside the city's foodbowl, and this is likely to continue.¹⁵ However, the global food system is itself under pressure from population growth, climate change and declining supplies of the natural resources underpinning food production, and global food supplies are likely to experience increasing disruption and volatility in food prices.¹⁶ The city foodbowls of Australia's other state capitals also make an important contribution to the nation's fresh food supply.¹⁷ However, they too are experiencing similar pressures to those facing Melbourne's foodbowl. Melbourne could become mostly dependent on these other sources of food by 2050, needing them to supply 82% of its food.¹⁸ This would significantly diminish the resilience of the city's food supply and its food security.

The loss of Melbourne's foodbowl is not inevitable as the city grows. If Melbourne is able to grow in a way that retains the productive capacity of its city foodbowl, the foodbowl could continue to provide an important source of fresh food for current and future generations. There are also opportunities for the foodbowl to provide sustainable livelihoods to existing and new generations of farmers, creating employment opportunities throughout the supply chain¹⁹ and underpinning a strong local and regional food economy.²⁰

Melbourne is renowned as a great food city.²¹ The availability and quality of food from its city foodbowl contributes to the city's liveability for residents and to its attractiveness as a destination for tourists.²² If fresh, local food is to be part of Melbourne's food future, the city will need to plan for food and for the resilience of its city foodbowl.

13 Reisinger, A., Kitching, R.L., Chiew, F., Hughes, L., Newton, P.C.D., Schuster, S.S., Tait, A. and Whetton, P. (2014) Australasia. In Barros, V.R. et al. (eds.) *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press, pp. 1371-1438.

14 UNEP Finance Initiative/Global Foodprint Network (2016) *ERISC Phase II: How food prices link environmental constraints to sovereign credit risk*. May 2016. Nairobi: United Nations Environment Programme.

15 Sheridan, J., Larsen, K. and Carey, R. (2015) As above.

16 UNEP Finance Initiative/Global Foodprint Network (2016) As above.

17 Sinclair, I. and Bunker, R. (2012) *Planning for Rural Landscapes* in Thompson, S. and Maginn, P. (eds) *Planning Australia*. Port Melbourne: Cambridge University Press, pp. 180-303.

18 Sheridan, J., Larsen, K. and Carey, R. (2015) As above.

19 Deloitte Access Economics (2016) As above.

20 Rose, N. and Larsen, K. (2013), 'Creative Food Economies': *Actions for Southern Melbourne – Input to Regional Food Plan*, Southern Melbourne Regional Development Authority.

21 City of Melbourne (2012) *Food City: City of Melbourne food policy*. Melbourne: City of Melbourne.

22 Tourism Australia (2012) *Consumer demand project: food and wine*. Sydney: Tourism Australia.

About this report

This report from the *Foodprint Melbourne* project makes the case for Melbourne to grow in a way that retains the capacity of its city foodbowl in order to strengthen the resilience of the city's food system to face future stresses and shocks, particularly from population growth and climate change. It presents a vision for a resilient city foodbowl and outlines the key elements of a policy framework to support this vision. The report draws on the findings of previous reports from the Foodprint Melbourne project (see below).

About the Foodprint Melbourne project

The Foodprint Melbourne project is led by the Victorian Eco-Innovation Lab at the University of Melbourne in collaboration with Deakin University and Sustain: The Australian Food Network. The project is funded by the Lord Mayor's Charitable Foundation. The Foodprint Melbourne project has three parts.

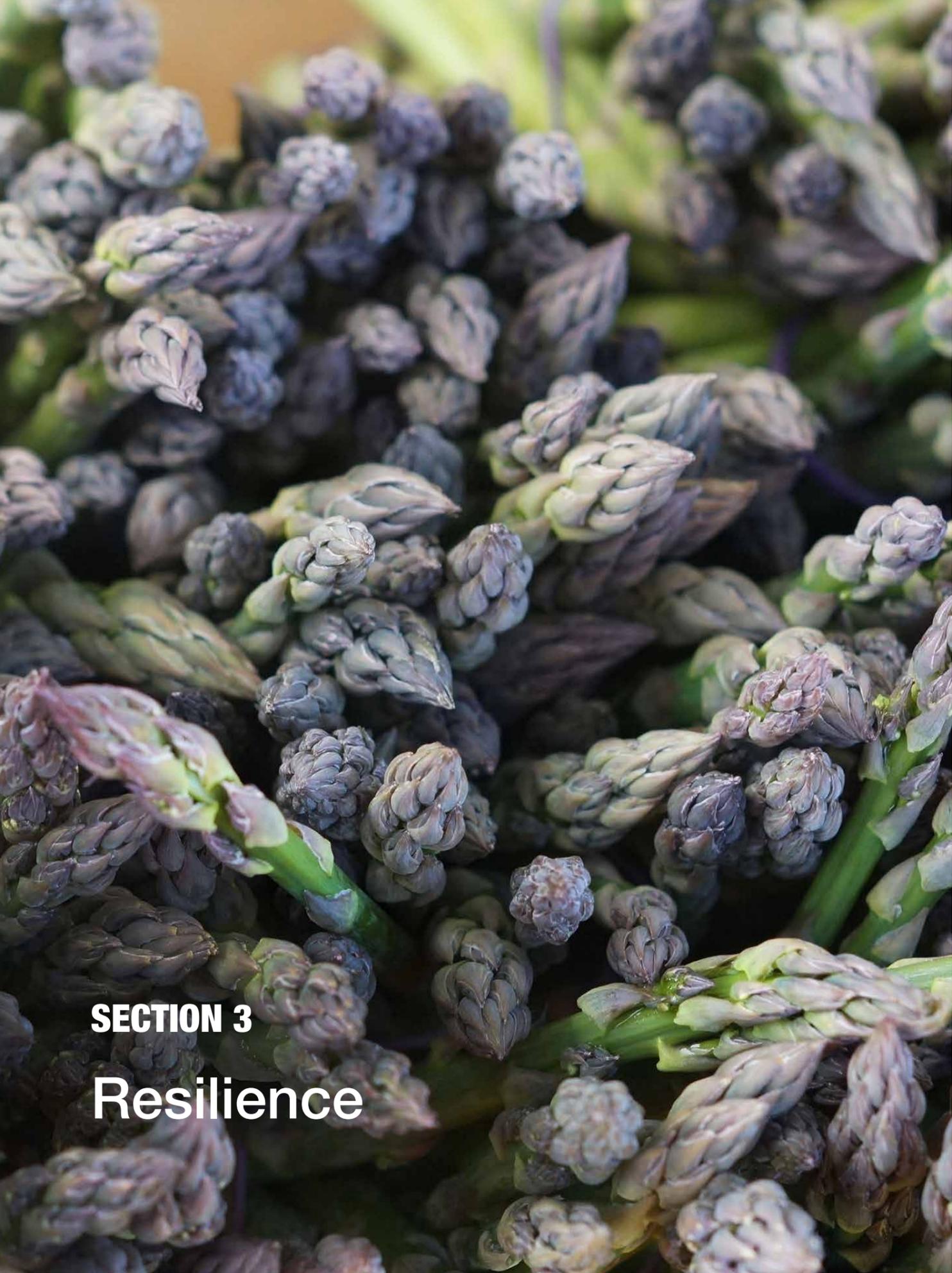
Part 1: Melbourne's Foodbowl – Part 1 investigated Melbourne's 'foodbowl'. It explored what grows in Melbourne's foodbowl and the capacity of the foodbowl to feed Melbourne, now and as the city expands in future. The report for Part 1²³ was released in December 2015.

Part 2: Melbourne's 'Foodprint' – Part 2 explored what it takes to feed Melbourne, now and as the city grows to a population of 7 million. It investigated how much land, water and energy are required, and the greenhouse gas emissions and waste generated. Part 2 also investigated the vulnerabilities in Melbourne's food supply, and the opportunities for strengthening the resilience and sustainability of Melbourne's regional food supply. The report for Part 2²⁴ was released in June 2016.

Part 3: Melbourne's Food Future – Part 3 explores the role of Melbourne's foodbowl in contributing to a resilient and sustainable food future for Melbourne, and it investigates the significance of Melbourne's foodbowl for the regional economy.

23 Sheridan, J., Larsen, K. and Carey, R. (2015) As above.

24 Sheridan, J., Carey, R. and Candy, S. (2016) *Melbourne's foodprint: What does it take to feed a city?* Melbourne: Victorian Eco-Innovation Lab.



SECTION 3

Resilience

3.1 Resilient Melbourne

The need for policy and planning to make Melbourne a resilient city has been widely recognised, and work is underway to ensure that Melbourne can meet future challenges through the development of the city's first resilience strategy.²⁵ The *Resilient Melbourne* strategy aims to strengthen the city's capacity to adapt to the chronic stresses and acute shocks that it is likely to experience in future. This includes chronic stresses such as rapid population growth, pressures on natural assets and the impacts of climate change, as well as sudden and acute shocks like bushfires, floods and heatwaves.²⁶ Victoria's draft 30-year infrastructure strategy also sets as one of its ten key objectives to "build resilience to shocks"²⁷, and the Plan Melbourne metropolitan planning process is exploring how the planning system can build Melbourne's resilience to the impacts of climate change through strategies such as protecting the city's natural assets, including its waterways and open spaces.²⁸

The *Resilient Melbourne* framework includes a focus on ensuring that people in the city have access to resources to meet their basic needs, including water, sanitation, energy and shelter.²⁹ Food is also a basic human need, but one that many of us take for granted.

Australia is generally perceived as a food secure nation. It produces far more food than is needed to feed the domestic population and exports a significant surplus.³¹ The rate of food insecurity among the general population is also relatively low compared to other parts of the world – around 4% of Australians are unable to afford to buy sufficient food.³² However, this perception masks underlying vulnerabilities. Rates of food insecurity are significantly higher than 4% among some population groups, such as Aboriginal and Torres Strait Islander peoples, asylum seekers, people on low incomes and those who are unemployed.³³ While Australia currently produces a large food surplus, there is also evidence that the nation may be unable to produce enough fruit and vegetables to meet the population's needs in future³⁴, and that climate change is likely to reduce Australia's capacity for food production.³⁵

Food security

Food security is commonly understood to exist when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Food security has four key dimensions:

Availability – the availability of sufficient quantities of appropriate food

Access – access to the resources to acquire sufficient quantities of appropriate food

Utilisation – the resources and capacity to utilise food

Stability – access to adequate food at all times³⁰

25 Resilient Melbourne (2016) Resilient Melbourne: Viable, sustainable, liveable, prosperous.

26 Resilient Melbourne (2016) As above.

27 Infrastructure Victoria (2016) Victoria's draft 30-year resilience strategy. October 2016. Melbourne: Infrastructure Victoria.

28 Victorian Government (2015) Plan Melbourne Refresh discussion paper. October 2015. Melbourne: Victorian Government.

29 Resilient Melbourne (2016) As above.

30 FAO (2006) Food security. Policy brief. June 2006. Issue 2. Rome: Food and Agriculture Organisation of the United Nations.

31 PMSEIC (2010) Australia and food security in a changing world. Canberra: The Prime Minister's Science, Engineering and Innovation Council.

32 ABS (2015) cat. no. 4364.0.55.009 Australian Health Survey: Nutrition - State and Territory results, 2011-12. Canberra: Australian Bureau of Statistics.

33 Lindberg, R., Lawrence, M., Gold, L., Friel, S. and Pegram, O. (2015) As above.

34 Sobels, J., Richardson, S., Turner, G., Maude, A., Tan, Y., Beer, A. and Wei, Z. (2010) Long term physical implications of net overseas migration: Australia in 2050. Adelaide: National Institute of Labour Studies; Larsen, K., Turner, G., Ryan, C. and Lawrence, M. (2011) Victorian food supply scenarios: Impacts of availability on a nutritious diet. Melbourne: Victorian Eco-Innovation Lab.

35 Reisinger, A., Kitching, R.L., Chiew, F., Hughes, L., Newton, P.C.D., Schuster, S.S., Tait, A. and Whetton, P. (2014) As above.

Chronic stresses such as population growth and urban sprawl could reduce the capacity of Melbourne's foodbowl to meet the city's future food needs from 41% currently to 18% by 2050.

The food system

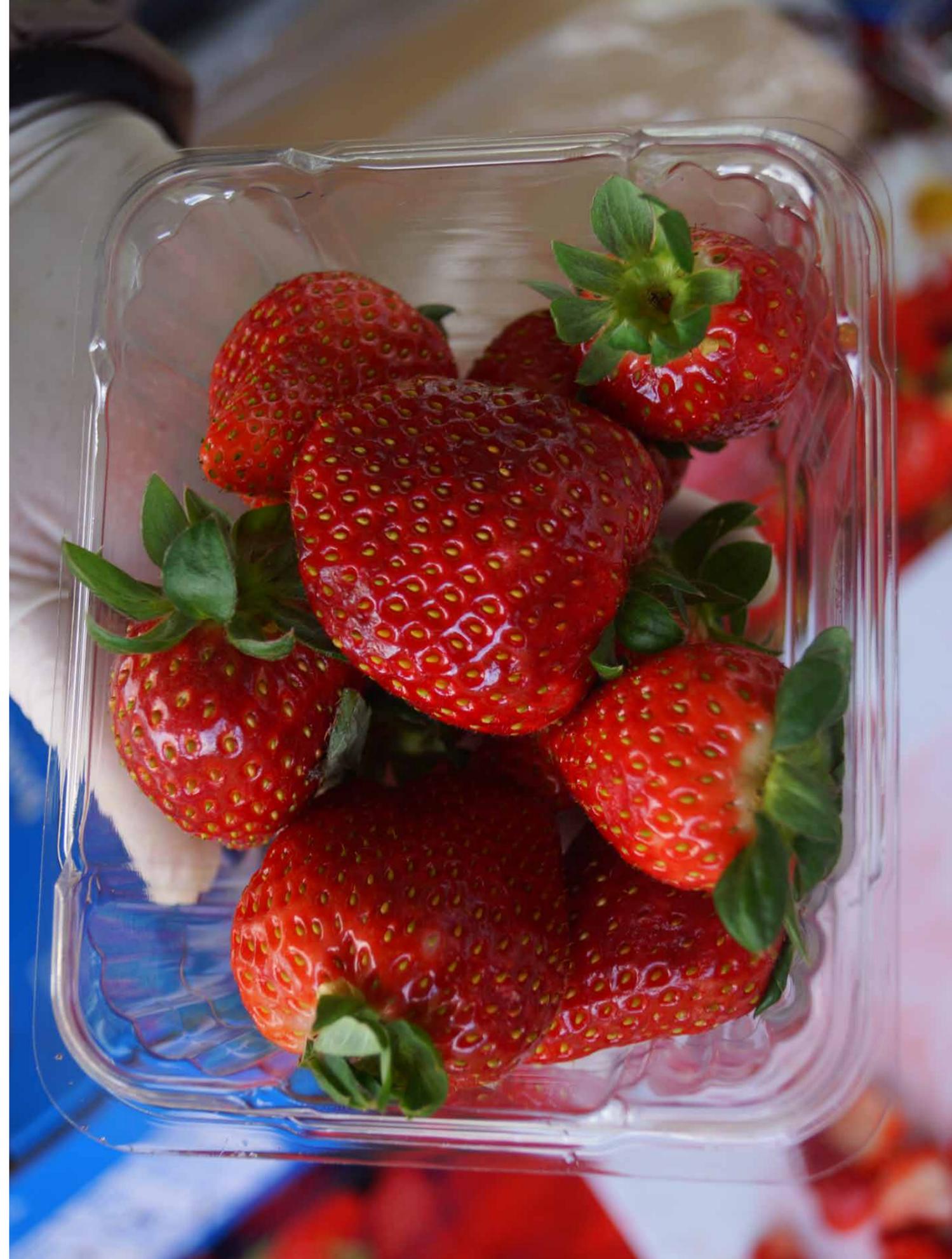
The food system describes all the activities involved in the production, processing, distribution and consumption of food, as well as the disposal of food waste. It also includes the people, animals, organisations and infrastructure involved in these activities.

Melbourne's food system is likely to be affected in future by many of the chronic stresses and acute shocks outlined in the *Resilient Melbourne* strategy. The Foodprint Melbourne report on *Melbourne's Foodbowl* highlighted that chronic stresses such as population growth and urban sprawl could reduce the capacity of Melbourne's foodbowl to meet the city's future food needs from 41% currently to 18% by 2050.³⁶ The project's report on *Melbourne's Foodprint* also identified vulnerabilities in the city's food supply due to pressures on natural assets, including water resources, farmland and the fossil fuel-based inputs that underpin the food system (such as energy and nitrogen-based fertilisers).³⁷ Climate change is likely to exacerbate these stresses and shocks. For example, changes to rainfall patterns are likely to lead to both chronic stresses such as drought (see the Millennium Drought case study) and acute shocks such as floods (see the Brisbane Floods case study).³⁸ This report also highlights how these chronic stresses could lead to rising food prices (see section 5.3 Water scarcity).

³⁶ Sheridan, J., Larsen, K. and Carey, R. (2015) Melbourne's foodbowl: Now and at seven million. Victorian Eco-Innovation Lab, The University of Melbourne.

³⁷ Sheridan, J., Carey, R. and Candy, S. (2016) Melbourne's foodprint: What does it take to feed a city. Victorian Eco-Innovation Lab, The University of Melbourne.

³⁸ Reisinger, A., Kitching, R.L., Chiew, F., Hughes, L., Newton, P.C.D., Schuster, S.S., Tait, A. and Whetton, P. (2014) As above.



Case study: Millennium Drought

Australia's Millennium Drought (1996-2010) was one of the worst droughts on record³⁹ and a stark example of the impacts of drought-related stress on food supply and food prices. Over a decade of drought had a significant impact on agricultural production in Australia. The decrease in agricultural production in 2002-03 led to a 1% drop in national GDP that year⁴⁰, and between 2006 and 2009, national GDP is estimated to have fallen 0.75% due to the drought.⁴¹

The Millennium Drought also led to a sharp increase in food prices in Australia. Food prices rose 12% between 2005 and 2007 (at double the overall rate of CPI) but the price of fresh vegetables increased by 33% during that period and the price of fresh fruit by 43%.⁴² The impact of these price increases on household food consumption and food insecurity is unknown, due to lack of monitoring.

Food exports also fell during the Millennium Drought⁴³, and food imports rose more sharply than average (food imports had been increasing at a rate of 6% each year from 1990 onwards), mostly through increasing imports of processed fruit and vegetables.⁴⁴ The increase in food imports likely buffered the impact of the drought on rising food prices in Australia, highlighting the importance of global – as well as national and local – sources of food to a resilient food system.

39 Steffen, W. (2013) *Thirsty country: Climate change and drought in Australia*. Sydney: Climate Council of Australia.

40 ABS (2014) cat. no. 1301.0 *Year book of Australia 2004: Impact of the drought on Australian production in 2002-3*. Canberra: Australian Bureau of Statistics.

41 Steffen, W. (2013) *As above*.

42 Quiggin, J. (2007) *Drought, climate change, and food prices in Australia*. Brisbane: University of Queensland.

43 PMSEIC (2010) *As above*.

44 PMSEIC (2010) *As above*.

Case study: Brisbane flood

The Queensland flood in December 2010-January 2011 was one of the worst in Australia's recent history, affecting three-quarters of the state, including Brisbane.⁴⁵ This acute shock tested the food system's resilience. Food supplies were affected through inundation of farming areas, distribution centres, supermarkets and Brisbane's main fresh produce market. All modes of transport were also affected, and flooded roads cut off major food supply routes.⁴⁶

There were shortages of some essential items in supermarkets, including bread and milk, which were exacerbated by panic buying.⁴⁷ However, there is evidence that the resilience of the system was improved by diversity in the supply chains. Short, more localised supply chains and long, just-in-time supermarket supply chains each had their own strengths and weaknesses.⁴⁸

Short, localised supply chains, such as community-supported agriculture box schemes, were able to respond rapidly to identify solutions to food shortages. They were able to connect local farmers and consumers, opening up their cold storage to local farmers who had produce to sell, and quickly finding alternative routes for their small distribution vehicles to reach consumers.⁴⁹

Longer, more centralised supply chains, such as those of the supermarkets, were quicker at detecting supply chain issues and responding to them by changing suppliers.⁵⁰ This had positive outcomes for consumers, as shelves were restocked quickly, but negative impacts for some local producers, as large retailers were more inclined to source produce from elsewhere, rather than finding ways to get local produce to market.⁵¹

45 DAFF (2012) *Resilience in the Australian food supply chain*. Canberra: Department of Agriculture, Fisheries and Forestry.

46 DAFF (2012) *As above*.

47 DAFF (2012) *As above*.

48 Smith, K., Lawrence, G., MacMahon, A., Muller, J., Brady, M. (2016) *The resilience of long and short food chains: a case study of flooding in Queensland, Australia*. *Agriculture and Human Values* 33: 45-60.

49 Smith, K., Lawrence, G., MacMahon, A., Muller, J., Brady, M. (2016) *As above*.

50 Smith, K., Lawrence, G., MacMahon, A., Muller, J., Brady, M. (2016) *As above*.

51 Smith, K., Lawrence, G., MacMahon, A., Muller, J., Brady, M. (2016) *As above*.

Becoming dependent on 'somewhere else' to meet growing shortfalls in food supply is likely to be an increasingly risky strategy.

3.2 Risks to global and national food supply

"The global food system is vulnerable to changing environmental conditions. Climate change along with land and water scarcity will increasingly affect food production on the supply side. At the same time, demand for food will increase as a result of global population and income growth. The growing imbalance between rising demand for food and the capacity to supply it, will lead to greater variability in food production, higher and more volatile food commodity prices, and a higher likelihood of price shocks"

UNEP Finance Initiative/Global Foodprint Network (2016)⁵²

It seems perhaps logical to assume that if Melbourne is not able to meet as much of its own food needs in future from its city foodbowl – due to chronic stresses like population growth, urban sprawl and water scarcity – then the city will be able to meet shortfalls in its food supply from 'somewhere else' in the global or national food supply chain. Indeed, Melbourne currently sources a significant amount of food from outside its immediate region, as the city foodbowl has the capacity to meet a maximum of just 41% of its own food needs⁵³, and some foods can't be produced in the region (e.g. tropical food crops) or are only produced in small quantities (e.g. oilseeds and cereal crops). Moreover, the capacity to source food from multiple regions is an important feature of a resilient food supply. However, becoming dependent on 'somewhere else' to meet growing shortfalls in food supply is likely to be an increasingly risky strategy, because the global and national food supply is facing similar stresses to Melbourne's foodbowl.

Chronic stresses facing the global food supply include population growth⁵⁴, land degradation and loss of productive farmland⁵⁵, the impacts of climate change⁵⁶, water scarcity⁵⁷ and the dependence of the food system on fossil fuels (for fertilisers, pesticides and refrigeration, as well as on farm fuel use).⁵⁸ These stresses are likely to lead to more frequent disruptions to global food supplies and a greater likelihood of spikes in global food prices.⁵⁹

52 UNEP Finance Initiative/Global Foodprint Network (2016) ERISC Phase II: How food prices link environmental constraints to sovereign credit risk. May 2016. Nairobi: United Nations Environment Programme.

53 Sheridan, J., Larsen, K. and Carey, R. (2015) As above.

54 Godfray, H. C., Crute, I. R., Haddad, L., Lawrence, D., Muir, J., Nisbett, N., Pretty, J., Robinson, S., Toulmin, C. and Whiteley, R. (2010) The future of the global food system. Philosophical Transactions of the Royal Society B. 365: 2769 – 2777.

55 Bot, A., Nachtegaele, F. and Young, A. (2000) Land resource potential constraints at regional and country levels, World Soil Resources Report 90. Rome: Food and Agriculture Organization of the United Nations.

56 Porter, J. R., Xie, L., Challinor, A.J., Cochrane, K., Howden, S.M., Iqbal, M.M., Lobell, D.B., and Travasso, M.I. (2014) Food security and food production systems. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. In Barros, V.R., Field, C.B., Dokken, D.J., Mastrandrea, M.D., Mach, K.J., Bilir, T.E., Chatterjee, M., Ebi, K.L., Estrada, Y.O., Genova, R.C., Girma, B., Kissel, E.S., Levy, A.N., MacCracken, S., Mastrandrea, P.R. and White, L.L. (eds.) (2014) As above, pp. 485-533.

57 Comprehensive Assessment of Water Management in Agriculture (2007) Water for Food, Water for Life: A comprehensive Assessment of Water Management in Agriculture. London: Earthscan, and Colombo: International Water Management Institute.

58 Woods, J., Williams, A., Hughes, J., Black, M. and Murphy, R. (2010) Energy and the food system. Philosophical Transactions of the Royal Society B 365: 2991-3006.

59 UNEP Finance Initiative/Global Foodprint Network (2016) As above.

Australia's national food supply faces the same chronic stresses as the global food supply.⁶⁰ The impacts of climate change on the food system are likely to be felt through chronic stresses, such as drought, as well as sudden shocks, such as increasing frequency and severity of floods and heatwaves.⁶¹ Moreover, food production in Australia is likely to be particularly affected by the impacts of climate change.⁶² Estimates of the impact of climate change on food production in Australia range from an overall 17% reduction in national agricultural production to a possible 92% drop in irrigated production in the Murray-Darling Basin by 2100 in the context of a very high emissions scenario and no global adaptation.⁶³ The potential impact of these climate-related events on food production and fresh food prices in Australia was felt during the Millennium Drought (1996-2010) and the 2010-11 Brisbane floods (see the featured case studies). It was also seen during a 2009 heatwave in Victoria, which resulted in the loss of 20-25% of the apple crop and 60-80% of the strawberry crop in the Port Phillip region⁶⁴, and more recently during storms and floods in South Australia in October 2016, which led to damage to horticultural crops estimated at \$20-30 million in the Northern Adelaide Plains region.⁶⁵

Australia's food supply chain is highly dependent on liquid fuels, and Australia is particularly vulnerable to disruptions in liquid fuel supplies. Australia is the only 'developed' oil/fuel importing country in the world that has no mandated industry stockholdings, government-owned stocks or government control over the oil/fuel infrastructure.⁶⁶ The International Energy Agency recommends that 90 days supply of liquid fuels is held, but Australia has around 34 days supply⁶⁷, and 3 days fuel supply is typically held at petrol stations.⁶⁸ This creates significant potential vulnerability in food supply for a nation with geographically isolated cities and a dependence on road transportation for food distribution (around 85% of food freight in Australia is transported by road).⁶⁹

Australia has only 9 days supply of dry foods and 7 days supply of frozen foods⁷⁰ – supply chain disruptions could see cities run short of food quickly. This could occur if concurrent events were to affect multiple locations at the same time – e.g. if storms or flooding were to affect both Brisbane and Sydney – or if events were to affect the food supply chain over an extended

Food production in Australia is likely to be particularly affected by climate change.

60 PMSEIC (2010) As above.

61 Hughes, L., Steffen, W., Rice, M., and Pearce, A. (2015) Feeding a hungry nation: Climate change, food and farming in Australia. Sydney: Climate Council of Australia.

62 Reisinger, A., Kitching, R.L., Chiew, F., Hughes, L., Newton, P.C.D., Schuster, S.S., Tait, A. and Whetton, P. (2014) As above.

63 Carey, R., Larsen, K. and Sheridan, J. (2015) The role of cities in climate-resilient food systems: A Foodprint Melbourne briefing. Victorian Eco-Innovation Lab, The University of Melbourne.

64 DPI 2009 cited in Hughes et al. (2015) as above.

65 Hough, C. and Volkofsky, A. (2016) Flooded horticulture region increases damage bill to SA's horticulture industry. ABC Rural, 4 October 2016.

66 RRATRC (2015), Australia's transport energy resilience and sustainability. Canberra: Rural and Regional Affairs and Transport References Committee, Australian Senate, Commonwealth of Australia, 25 June 2015.

67 NB. the Inquiry also had concerns about data reliability.

68 NRMA (2015), Submission 18, cited in RRATRC (2015) As above, p28.

69 DAFF (2012) Resilience in the Australian food supply chain. Canberra: Department of Agriculture, Fisheries and Forestry.

70 NRMA (2015), Submission 18, cited in RRATRC (2015) As above, p28.

Australia's city foodbowls produce around 47% of the nation's perishable vegetables.

period of time e.g. a national or international pandemic.⁷¹ A pandemic has been identified as the fourth greatest risk to Melbourne's economy⁷², and could have a significant impact on food supplies through the necessity for rapid action to prevent the spread of disease, such as the need to cull animals or cease imports (either nationally or more locally) to prevent disease transmission.

Australia's city foodbowls

The foodbowls that surround Australia's other major cities form an important part of the national food supply on which Melbourne depends, particularly for fresh vegetables. Market gardens spread out around Australia's cities in the 1800s, and have played an important role in feeding city populations.⁷³ These city foodbowls still make an important contribution to the nation's fresh food supply, particularly to the production of perishable vegetables.⁷⁴ However, all face similar stresses from population growth and urban sprawl to those facing Melbourne's foodbowl, and they are unlikely to have the capacity to meet future shortfalls in Melbourne's fresh vegetable needs.

Australia's city foodbowls produce around 47% of the nation's perishable vegetables.⁷⁵ If production in other peri-urban coastal areas is also included, then around 70% of Australia's perishable vegetable production occurs in areas at risk of urbanisation.⁷⁶



Figure 1: Proportion of state perishable vegetable production by weight produced in capital city peri-urban and high growth coastal areas 2011. Prepared by Ian Sinclair from ABS (2012) 7121 Agricultural Commodities Australia 2010-11.⁷⁷

71 DAFF (2012) As above.

72 Lloyd's (2015), Lloyd's City Risk Index 2015-2025 – Melbourne, identified pandemic as the fourth most significant risk to Melbourne by impact on GDP

73 Bilson, G. (2007) One continuous picnic: A gastronomic history of Australia. Melbourne: Melbourne University Press.

74 Sinclair, I. (2015) Growing Food in a Residential Landscape. Paper presented at The State of Australian Cities Conference 2015, 9-11 December 2015, The Gold Coast, Queensland.

75 Sinclair, I. (2015) As above.

76 Sinclair, I. and Bunker, R. (2012) Planning for Rural Landscapes in Thompson, S. and Maginn, P. (eds) Planning Australia, pp 180-303. Melbourne: Cambridge University Press.

77 Updated chart, based on a chart in Sinclair, I. and Bunker, R. (2012) As above.

Peri-urban regions of Australia's cities are highly productive. It has been estimated that the peri-urban regions of Australia's five main states produce around 25% of the value of agricultural production from just 3% of the agricultural land in those states.⁷⁸ Two of the five most productive local government areas in Australia for vegetable production are in peri-urban areas.⁷⁹

Australia's five major state capitals have some of the highest rates of population growth in the OECD.⁸⁰ Around 66% of Australia's population lived in the nation's capital cities in 2011, and projections suggest that this is likely to increase to 73% by 2061 – an addition of 15.7 million people.⁸¹ Australia's capitals also have relatively low rates of urban density, with much of their growth occurring on the city fringe.⁸²

The likely impact of population growth and urban sprawl on Australia's food supply is unclear, due to lack of data. However, it has been estimated that between 2000 and 2006 the cities of Sydney, Melbourne, Adelaide and Perth lost between 4 and 11% of the land area available for fruit production, while the area available for vegetable production fell by about 28% in Brisbane and 14% in Perth.⁸³ Loss of farmland in Australia's city foodbowls has the potential to affect national production of some crops. For example, 28% of Australia's strawberries are produced on Brisbane's fringe, and 40% are produced on Melbourne's fringe.⁸⁴ If both city foodbowls were to lose areas of strawberry production to urban sprawl, this could impact national production and availability of these berries.

Loss of farmland in Australia's city foodbowls has the potential to affect national production of some crops.

78 Houston, P. (2005) Re-valuing the fringe: Some findings on the value of agricultural production in Australia's peri-urban regions. Geographical Research 43 (2): 209-223.

79 Sinclair, I. (2015) As above.

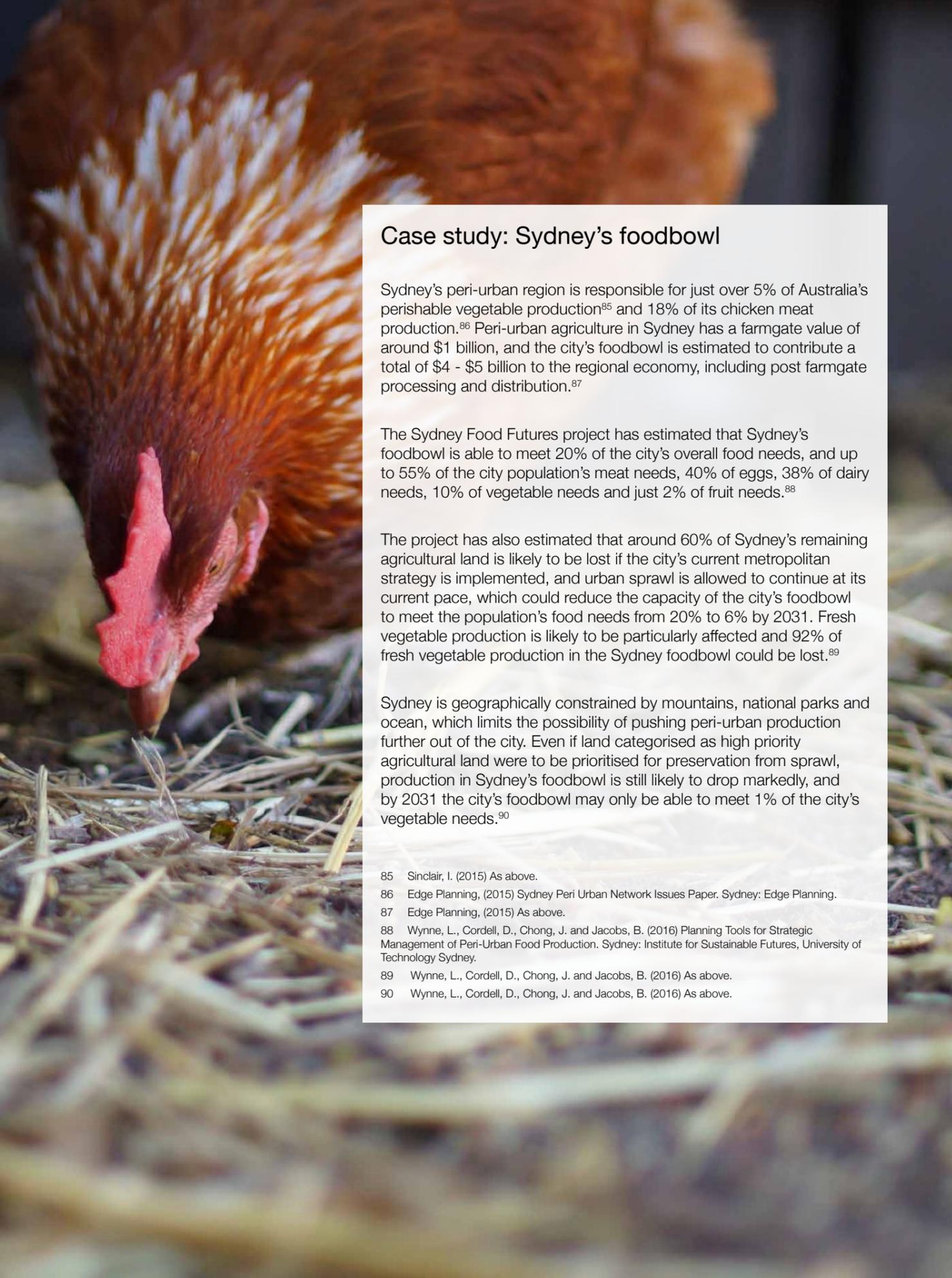
80 Department of Infrastructure and Regional Development (2015) State of Australian cities 2014-15. Progress in Australian regions. Canberra: Department of Infrastructure and Regional Development.

81 Infrastructure Australia (2015) Population Estimates and Projections - Australian Infrastructure Audit Background Paper. Canberra: Infrastructure Australia.

82 Spencer, A., Gill, J. and Schmahmann, L. (2015) Urban or Suburban? Examining The Density of Australian Cities in a Global Context. Paper presented at The State of Australian Cities Conference 2015, 9-11 December 2015, The Gold Coast, Queensland.

83 Ramsey, R. and Gallegos, D. (2011) What Are the Implications of Peri-Urban Agriculture on Food Security in Australian Cities? Paper presented at 2nd National Food Futures Conference, 22-23 November 2011, Hobart, TAS.

84 ABS (2013) cat. no. 7121.0 Agricultural Commodities, Australia, 2010-11. Canberra: Australian Bureau of Statistics.



Case study: Sydney's foodbowl

Sydney's peri-urban region is responsible for just over 5% of Australia's perishable vegetable production⁸⁵ and 18% of its chicken meat production.⁸⁶ Peri-urban agriculture in Sydney has a farmgate value of around \$1 billion, and the city's foodbowl is estimated to contribute a total of \$4 - \$5 billion to the regional economy, including post farmgate processing and distribution.⁸⁷

The Sydney Food Futures project has estimated that Sydney's foodbowl is able to meet 20% of the city's overall food needs, and up to 55% of the city population's meat needs, 40% of eggs, 38% of dairy needs, 10% of vegetable needs and just 2% of fruit needs.⁸⁸

The project has also estimated that around 60% of Sydney's remaining agricultural land is likely to be lost if the city's current metropolitan strategy is implemented, and urban sprawl is allowed to continue at its current pace, which could reduce the capacity of the city's foodbowl to meet the population's food needs from 20% to 6% by 2031. Fresh vegetable production is likely to be particularly affected and 92% of fresh vegetable production in the Sydney foodbowl could be lost.⁸⁹

Sydney is geographically constrained by mountains, national parks and ocean, which limits the possibility of pushing peri-urban production further out of the city. Even if land categorised as high priority agricultural land were to be prioritised for preservation from sprawl, production in Sydney's foodbowl is still likely to drop markedly, and by 2031 the city's foodbowl may only be able to meet 1% of the city's vegetable needs.⁹⁰

85 Sinclair, I. (2015) As above.

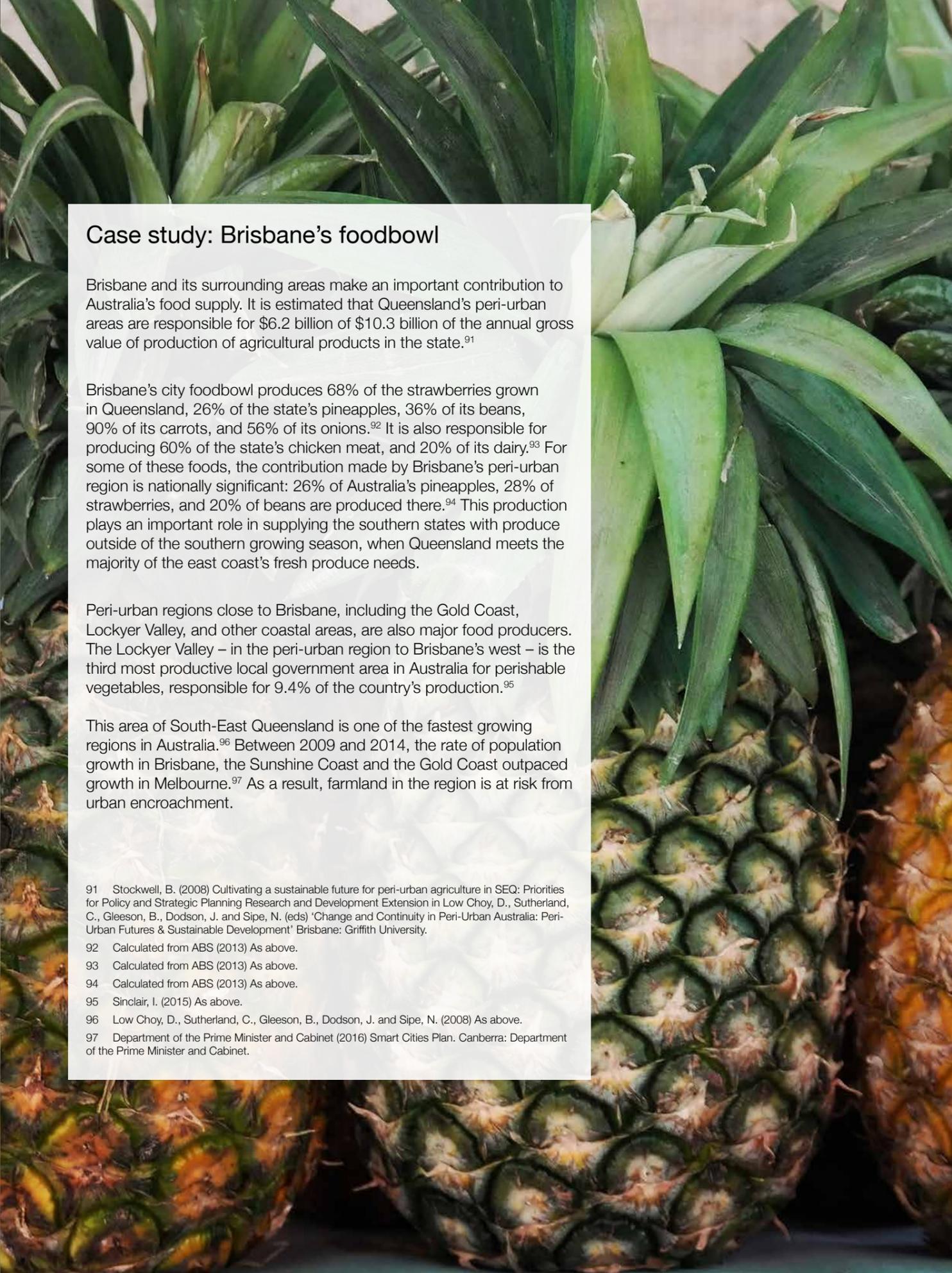
86 Edge Planning, (2015) Sydney Peri Urban Network Issues Paper. Sydney: Edge Planning.

87 Edge Planning, (2015) As above.

88 Wynne, L., Cordell, D., Chong, J. and Jacobs, B. (2016) Planning Tools for Strategic Management of Peri-Urban Food Production. Sydney: Institute for Sustainable Futures, University of Technology Sydney.

89 Wynne, L., Cordell, D., Chong, J. and Jacobs, B. (2016) As above.

90 Wynne, L., Cordell, D., Chong, J. and Jacobs, B. (2016) As above.



Case study: Brisbane's foodbowl

Brisbane and its surrounding areas make an important contribution to Australia's food supply. It is estimated that Queensland's peri-urban areas are responsible for \$6.2 billion of \$10.3 billion of the annual gross value of production of agricultural products in the state.⁹¹

Brisbane's city foodbowl produces 68% of the strawberries grown in Queensland, 26% of the state's pineapples, 36% of its beans, 90% of its carrots, and 56% of its onions.⁹² It is also responsible for producing 60% of the state's chicken meat, and 20% of its dairy.⁹³ For some of these foods, the contribution made by Brisbane's peri-urban region is nationally significant: 26% of Australia's pineapples, 28% of strawberries, and 20% of beans are produced there.⁹⁴ This production plays an important role in supplying the southern states with produce outside of the southern growing season, when Queensland meets the majority of the east coast's fresh produce needs.

Peri-urban regions close to Brisbane, including the Gold Coast, Lockyer Valley, and other coastal areas, are also major food producers. The Lockyer Valley – in the peri-urban region to Brisbane's west – is the third most productive local government area in Australia for perishable vegetables, responsible for 9.4% of the country's production.⁹⁵

This area of South-East Queensland is one of the fastest growing regions in Australia.⁹⁶ Between 2009 and 2014, the rate of population growth in Brisbane, the Sunshine Coast and the Gold Coast outpaced growth in Melbourne.⁹⁷ As a result, farmland in the region is at risk from urban encroachment.

91 Stockwell, B. (2008) Cultivating a sustainable future for peri-urban agriculture in SEQ: Priorities for Policy and Strategic Planning Research and Development Extension in Low Choy, D., Sutherland, C., Gleeson, B., Dodson, J. and Sipe, N. (eds) 'Change and Continuity in Peri-Urban Australia: Peri-Urban Futures & Sustainable Development' Brisbane: Griffith University.

92 Calculated from ABS (2013) As above.

93 Calculated from ABS (2013) As above.

94 Calculated from ABS (2013) As above.

95 Sinclair, I. (2015) As above.

96 Low Choy, D., Sutherland, C., Gleeson, B., Dodson, J. and Sipe, N. (2008) As above.

97 Department of the Prime Minister and Cabinet (2016) Smart Cities Plan. Canberra: Department of the Prime Minister and Cabinet.

City region food systems have an important role in food system resilience.

3.3 A resilient food future for Melbourne

What is a resilient food system?

A resilient food system is a system that has the capacity over time to provide sufficient healthy, sustainable and fair food to all in the face of chronic stresses and sudden shocks, including unforeseen circumstances. A resilient food system is robust (it can withstand disturbances without losing food security), has redundancy (elements of the system are replaceable and can absorb the effects of stresses and shocks), is flexible, can quickly recover lost food security and can adapt to changing circumstances.⁹⁸

Resilient food systems are likely to have some of the following features:

- The capacity to **draw on food sources from multiple geographical regions**, including global, national and regional sources, without being dependent on any one source
- **Diversified food supply chains** that draw on large-scale and small-scale systems of food production and distribution, use a variety of approaches to production and distribution, and draw on both commercial and community-based sources
- The capacity to **draw on waste streams** (waste water, food waste and organic waste) for food production⁹⁹
- The capacity to **create synergies** and achieve multiple benefits across a range of policy objectives¹⁰⁰ e.g. increasing access to healthy food, and creating jobs
- They are **people-centred and inclusive** – people are at the heart of the food system¹⁰¹, benefiting from increased access to healthy, sustainable food and from employment, and they engage actively with the food system as citizen-consumers

98 This definition of food system resilience draws on a definition in Tendall, D., Joerin, J., Kopainsky, B., Edwards, P., Shreck, A., Le, Q., Kruetli, P., Grant, M. and Six, J. (2015) Food system resilience: defining the concept. *Global Food Security* 6 pp. 17-23. It also draws on the City of Melbourne Food Policy, Food City.

99 Wiskerke, J. (2015) *Urban food systems in de Zeeuw*, H. and Drechsel, P. (2015) *Cities and agriculture: developing resilient urban food systems*. London: Routledge.

100 Wiskerke, J. (2015) As above.

101 ICLEI (2013) Resilient urban food systems in brief. Resilient urban food systems forum. 1 June 2013 at Resilient Cities 2013.

The role of city region food systems

City region food systems are increasingly recognised as having an important role in food system resilience. A city region food system describes an urban centre (such as Greater Melbourne) and its surrounding peri-urban and rural hinterland (such as Melbourne's foodbowl). It includes all the actors, processes and relationships that are involved in food production, processing, distribution and consumption in the region.¹⁰²

The importance of regional food production to a resilient food system is widely recognised in a number of international policy declarations and frameworks, including the 2014 Medellin Call for Action¹⁰³, the 2015 Seoul Declaration¹⁰⁴ and the Milan Urban Food Policy Pact¹⁰⁵, to which the City of Melbourne is a signatory.

The Milan Urban Food Policy Pact includes a recommended action to, "promote and strengthen urban and peri-urban food production and processing based on sustainable approaches and integrate urban and peri-urban agriculture into city resilience plans". The importance of regional food production to a resilient food system also recognised in the City of Melbourne Food Policy.¹⁰⁶ However, no significant action has yet been taken within state policy frameworks to strengthen the resilience of Melbourne's city foodbowl.

Food security is now firmly on the international urban planning agenda. The *New Urban Agenda* adopted in October 2016 at the United Nations conference on Housing and Sustainable Development – Habitat III – emphasises the need to "strengthen food system planning" and recognises that dependence on distant sources of food and other resources can create sustainability challenges and vulnerabilities to supply disruptions. The agenda includes a commitment to:

"Support urban agriculture and farming, as well as responsible, local, and sustainable consumption and production, and social interactions, through enabling accessible networks of local markets and commerce as an option to contribute to sustainability and food security"

*Habitat III New Urban Agenda.*¹⁰⁷

102 Forster, T., Hussein, K., and Mattheisen, E. (2015) City region food systems: An integrated approach to improving food systems and urban-rural linkages. *Urban Agriculture Magazine* 29, May 2015.

103 City region food systems: sustainable food systems and urbanization – a call for action. On the occasion of the World Urban Forum 7, Medellin, Colombia –revised for the CFS October 2014.

104 ICLEI Seoul Declaration for Sustainable Cities: Building a world of local action for a sustainable urban future. ICLEI World Congress, 9 April 2015.

105 Milan Urban Food Policy Pact, 15 October 2015.

106 See Theme 3, A sustainable and resilient food system, in City of Melbourne (2015) As above.

107 Habitat III New Urban Agenda. Draft outcome document for adoption in Quito, October 2016.

Food security is now firmly on the international urban planning agenda.

If Melbourne is to prepare effectively to meet future food system challenges, it will need to plan for food.

Planning a resilient city foodbowl

If Melbourne is to prepare effectively to meet future food system challenges, it will need to plan for food. Although food is a basic need, it has been overlooked in Melbourne’s metropolitan planning strategies and Victoria’s state planning policy framework.¹⁰⁸ Indeed, food has been overlooked in metropolitan planning strategies across Australia.¹⁰⁹

Melbourne’s foodbowl could strengthen the resilience of the city’s food system in the context of increasing pressures on global and national food supplies. Retaining the productive capacity of Melbourne’s foodbowl could reduce the dependence of the city’s population on distant sources of food and provide a buffer against increasing volatility in global and national food supplies and prices. Maintaining areas of fresh food production close to the city could provide flexibility in responding to shocks that disrupt supply chains, as occurred during the 2010-11 Brisbane floods (see case study).

Maintaining food production close to the city can optimise use of available natural resources for food production.¹¹⁰ Cities can access valuable waste streams – particularly recycled water and organic waste – that can provide reliable sources of water and fertilisers when other provision systems fail.

Melbourne’s foodbowl could strengthen the resilience of the city’s food system in the context of increasing pressures on global and national food supplies.

While it is clear that the global food system faces growing challenges, there is considerable uncertainty about how these challenges will unfold and their likely impacts. Adopting a precautionary approach to retaining Melbourne’s foodbowl will provide the city with greater flexibility to adapt to stresses and ensure a sustainable and resilient food supply.

This report explores the role of Melbourne’s city foodbowl in contributing to a more resilient and sustainable food system for the city. Building food system resilience requires a ‘whole of supply chain’ approach from production, through distribution and consumption.¹¹² It also includes the capacity of city food systems to withstand and quickly recover from natural disasters.¹¹³ This report focuses primarily on the production stage of the food supply chain, and explores the role of a resilient and sustainable city foodbowl in strengthening the resilience of Melbourne’s food system.

Resilient and sustainable food systems need	Cities have
Fertile land	Areas of highly fertile land - cities were often founded in places with highly fertile land to provide a secure food source for their growing populations
Water	Access to secure sources of recycled water from city water treatment plants and desalination plants, as well as storm water from urban water catchments
Fertilisers	Abundant supplies of under-utilised organic waste that can be converted to compost and utilised for food production
Labour	Access to sources of labour that may be scarcer in more remote and regional areas
Food processing infrastructure	Good access to infrastructure for secondary food processing and manufacturing
Transport infrastructure	Good road systems and transport links to move fresh foods quickly and efficiently to population centres
Proximity to markets	Close proximity to key markets for fresh foods in major population centres

Table 1: Role of cities in resilient and sustainable food systems¹¹¹

108 Buxton, M. and Carey, R. (2014) The use of planning provisions and legislation to protect peri-urban agricultural land. Australian Environment Review. September 2014: 191-195.

109 Budge, T. (2013) Is food a missing ingredient in Australia’s metropolitan planning strategies? In Farmar-Bowers, Q., Higgins, V. and Millar, J. (eds) Food security in Australia: Challenges and prospects for the future, pp. 367-380. New York: Springer.

110 Carey, R., Larsen, K. and Sheridan, J. (2015) As above.

111 This table was sourced from Carey, R., Larsen, K. and Sheridan, J. (2015) As above.

112 Tendall et al. (2015) As above.

113 ICIC (2015) Resilient food systems, resilient cities: Recommendations for the city of Boston. May 2015. Boston: Initiative for a Competitive Inner City.



SECTION 4

Melbourne's foodbowl

4.1 Capacity of Melbourne's foodbowl to feed the city

Melbourne is at the centre of a highly productive agricultural region – its 'foodbowl'. Melbourne's foodbowl has two distinct regions: the inner and outer foodbowl, illustrated in figure 2 below. The inner foodbowl is made up of Melbourne's urban councils and the 'Interface' councils on the metropolitan fringe that border the Urban Growth Boundary. The outer foodbowl comprises the next 'ring' of peri-urban councils that corresponds to the 'Peri-urban Group of Rural Councils', from the Surf Coast in the west around to Bass Coast in the east.¹¹⁴

Melbourne's foodbowl currently has the capacity to meet around 41% of Greater Melbourne's overall food needs.

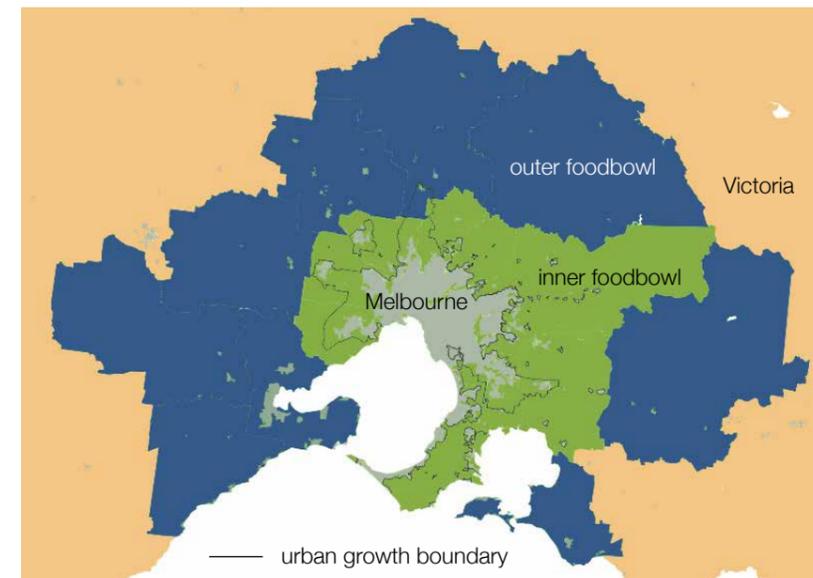


Figure 2: Melbourne's foodbowl

Melbourne's foodbowl currently has the capacity to meet around 41% of Greater Melbourne's overall food needs. It can meet a high proportion of the city's demand for some types of foods. For example, it produces more chicken meat and eggs than is needed to feed the city. It can also meet 82% of the city's vegetable needs, 63% of the city's red meat requirement, 39% of its dairy needs and 13% of its fruit requirement. For other types of foods, such as grains, the foodbowl is only able to meet a small proportion of the city's food needs.¹¹⁵

¹¹⁴ For a full list of the local government areas in Melbourne's foodbowl, see Sheridan, J., Larsen, K., and Carey, R. (2015) Melbourne's Foodbowl: Now and at Seven Million. Melbourne: Victorian Eco-Innovation Lab.

¹¹⁵ Sheridan, J., Larsen, K., and Carey, R. (2015) As above.

The inner foodbowl produces a large proportion of highly perishable crops, such as fruit and vegetables.

The inner foodbowl produces a large proportion of highly perishable crops, such as fruit and vegetables, that benefit from being close to markets. Melbourne's inner foodbowl produces 23% of the state's vegetables and 7% of its fruit, including 62% of lettuce, 93% of herbs, 94% of asparagus and 96% of berry fruits.¹¹⁶ A high proportion of the state's poultry farming also occurs in the inner foodbowl, with 59% of the state's chicken meat and over a third of its eggs produced there.¹¹⁷



Figure 3. Excerpt from Melbourne's Foodbowl Infographic

116 Sheridan, J., Larsen, K., and Carey, R. (2015) As above.
 117 Sheridan, J., Larsen, K., and Carey, R. (2015) As above.

The outer foodbowl is a more diverse region of food production than the inner foodbowl. In addition to fruit and vegetable production, there is some livestock grazing and dairy production, and growing of grains and oilseeds (e.g. sunflowers).¹¹⁸ The outer foodbowl also produces around a third of the state's eggs and 24% of chicken meat.¹¹⁹ Beyond Melbourne's foodbowl, in regional Victoria, there is more broadacre cropping of cereal grains, and the bulk of the state's grazing for beef, lamb and dairy production.

Food Type	% of Victoria's production occurring in Melbourne's foodbowl
Dairy	12%
Sugar	Not produced
Fruit	8%
Oil crops	7%
Cereal grains	3%
Vegetables	47%
Red meat	15%
Chicken meat	81%
Fish & seafood	Not studied
Rice	0%
Legumes	1%
Eggs	67%

Table 2: % of Victoria's Production Occurring in Melbourne's Foodbowl

It is unclear exactly how much of the food produced in Melbourne's foodbowl is consumed in the city, due to a lack of data about food freight within Victoria, and between Victoria and other states. For further details about what grows in Melbourne's foodbowl and the capacity of the foodbowl to feed the city, see the first report from the Foodprint Melbourne project - *Melbourne's Foodbowl: Now and at seven million*.

118 Sheridan, J., Larsen, K., and Carey, R. (2015) As above.
 119 Sheridan, J., Larsen, K., and Carey, R. (2015) As above.

Melbourne's foodbowl contributes \$2.45 billion per annum to the city's regional economy, and creates 21,001 full-time equivalent (FTE) jobs.

4.2 Economic contribution of Melbourne's foodbowl

Production in Melbourne's foodbowl also makes an important contribution to Melbourne's regional economy and to employment opportunities. Deloitte Access Economics carried out an economic analysis of Melbourne's foodbowl for the Foodprint Melbourne project. This section presents some of the findings of this analysis – for more details, see the full report by Deloitte Access Economics.¹²⁰

Melbourne's foodbowl contributes \$2.45 billion per annum to the city's regional economy, and creates 21,001 full-time equivalent (FTE) jobs.¹²¹ The total economic contribution of Melbourne's foodbowl includes (see table 3):

- the direct contribution from agricultural production in the foodbowl, which amounts to \$956 million per annum and 7,687 jobs (FTE)
- an indirect contribution from the 'upstream' sectors that provide inputs to agriculture in the foodbowl (fertilisers, seeds, animal feed, water and machinery), which represents an additional \$742 million per annum and 5,719 jobs (FTE)
- a direct contribution from the 'downstream' food manufacturing sectors that use agricultural products grown in the foodbowl, which contribute an additional \$756 million per annum and 7,595 jobs (FTE)

	Agriculture		Food Manufacturing	Total agri-food contribution
	Direct	Indirect	Direct	
Value added (\$ million)	956	742	756	2,454
Employment (FTEs)	7,687	5,719	7,595	21,001

Table 3: Economic contribution of agriculture and food manufacturing in Melbourne's foodbowl¹²²

Economic contribution by industry sector

The fruit and vegetable industries make the biggest economic contribution in Melbourne's foodbowl (43% of the total contribution of agriculture), and employ the largest number of people in agriculture (39% of the total number employed). The indirect contribution of these industries is relatively low compared to their direct contribution, as there is relatively little secondary processing. Other animal products (eggs, pigs and poultry) make the second largest overall economic contribution and make the highest indirect contribution, as these products use a lot of inputs and have a high degree of secondary processing (see table 4 below)

Commodity group	Value added (\$ million)		Employment (FTEs)	
	Direct	Indirect	Direct	Indirect
Food crops	43	23	403	163
Vegetables and Fruits	413	151	2997	1,052
Livestock	163	145	1493	1,107
Other animal products	201	290	1537	2,387
Dairy	137	134	1257	1,011
Total	956	742	7,687	5,719

Table 4: Sectoral economic contribution in Melbourne's foodbowl¹²³

120 Deloitte Access Economics (2016) The economic contribution of Melbourne's Foodbowl, A report for the Foodprint Melbourne project, University of Melbourne. Melbourne: Deloitte Access Economics.

121 Deloitte Access Economics (2016) As above.

122 Reproduced from Deloitte Access Economics (2016). Note that value added figures are denoted in 2014-15 dollars.

123 Deloitte Access Economics (2016) As above.

The vegetable industry makes the greatest contribution to the gross value of agricultural production in Melbourne's foodbowl.

Economic contribution of agriculture

The vegetable industry makes the greatest contribution to the gross value of agricultural production in Melbourne's foodbowl, generating over \$400 million in value, with the majority of production occurring in the inner foodbowl.¹²⁴

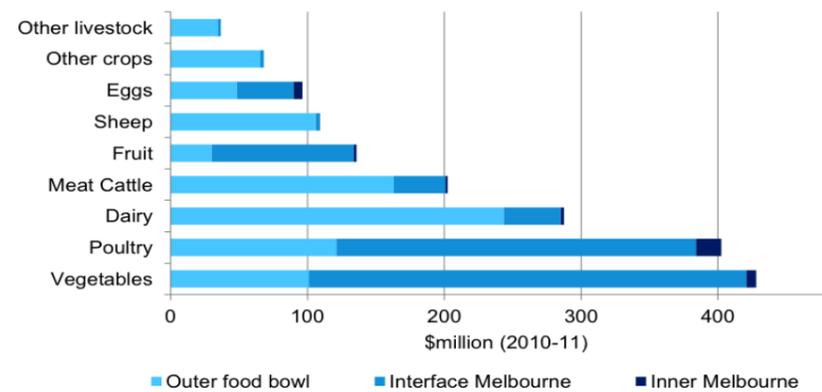


Figure 4: Gross value of agricultural production in Melbourne's foodbowl¹²⁵

This is followed by poultry production, which contributes approximately \$400 million in gross value, with the majority of production also occurring in the inner foodbowl.¹²⁶ Dairy production contributes just under \$300 million and takes place predominantly in the outer foodbowl, as does beef production, which contributes around \$200 million in gross value.¹²⁷

Cattle and sheep farming makes the greatest contribution to employment in agriculture in Melbourne's foodbowl. Close to 2400 FTE work in this sector in the outer foodbowl, and almost another thousand FTE in the inner foodbowl.¹²⁸ The vegetable industry makes the second largest contribution to agricultural employment in Melbourne's foodbowl, with close to 2000 FTE employees, most of whom are employed in the inner foodbowl.¹²⁹ The actual number of people employed in the agricultural industries in Melbourne's foodbowl is higher than the FTE equivalents suggest, due to the seasonal nature of much agricultural employment (a total of 9,200 people are employed in the food-producing agricultural industries in Melbourne's foodbowl, compared to the FTE equivalent of 7,687 people).

124 Deloitte Access Economics (2016) As above.

125 Reproduced from chart 2.3 in Deloitte Access Economics (2016).

126 Deloitte Access Economics (2016), As above.

127 Deloitte Access Economics (2016), As above.

128 Deloitte Access Economics (2016), As above.

129 Deloitte Access Economics (2016), As above.

Other economic contributions from Melbourne's foodbowl

There are a number of other ways that Melbourne's foodbowl contributes to the regional economy that are not included in the assessment above. These include the economic contribution of other 'downstream' sectors that benefit significantly from agricultural production in the city foodbowl, such as transport and wholesale distribution, and also the contribution that Melbourne's foodbowl makes to the tourism and hospitality sectors in the region. These contributions are difficult to quantify, so have not been included.

Melbourne is arguably Australia's premier 'food city', and is marketed to domestic and international visitors as a 'food destination'.¹³⁰ Eating out in the city's restaurants is one of the main activities for Melbourne tourists¹³¹, and the city's foodbowl has important food and wine tourism destinations, including the Yarra Valley and Mornington Peninsula.¹³² The quality and regional provenance of produce is a key part of the food tourism experience. Tourism Australia research suggests that 'good food, wine, local cuisine and produce' is a key factor in holiday decision-making for international tourists to Australia, and the most important perceived element of 'good food and wine' is 'fresh local produce grown or raised in pristine natural environments'.¹³³ The importance of fresh local produce for food tourism suggests that produce from Melbourne's foodbowl - and the landscape values of the foodbowl region - make a significant contribution to the current value of food tourism. It also suggests that there is potential to grow food tourism in the Melbourne region by more strongly linking food experiences to the fresh produce grown in Melbourne's foodbowl and by making produce from the city's foodbowl more easily available and identifiable in the region's restaurants, cafes, shops and markets.

Melbourne is arguably Australia's premier 'food city' and is marketed to domestic and international tourists as a 'food destination'.

130 Tourism Victoria (2015) Annual report 2014-15. Melbourne: Tourism Victoria.

131 Tourism Victoria (2014) Melbourne market profile: Year ending 2013. Melbourne: Tourism Victoria.

132 Tourism Victoria (2015) As above.

133 Tourism Australia (2012) Consumer demand project: food and wine. Sydney: Tourism Australia.

The US Secretary of Agriculture has described local and regional food systems as one of 'the four pillars of agriculture and rural economic development'.

4.3 Growing Melbourne's regional food economy

"From a public policy perspective, sustainable agriculture is... one of the best uses of land in the green wedges and peri-urban Melbourne. It manages and preserves the landscape, supports local jobs and local economies, allows access to fresh and healthy food close to consumers and holds opportunities for the management and re-use of waste and water"

*Inquiry into Sustainable Development of Agribusiness in Outer Suburban Melbourne*¹³⁴

The Foodprint Melbourne project has identified a range of risks to the sustainability and resilience of Melbourne's foodbowl, including risks to Melbourne's regional economy due to loss of productive agricultural land (see section 5.1). However, a resilient city foodbowl also creates opportunities to grow the contribution that local and regional food systems make to Melbourne's regional economy.

There is no widely accepted definition of 'local and regional food systems' in an Australian context. However, the US Department of Agriculture (USDA) describes 'local and regional food systems' as systems that connect all of the activities associated with producing, processing, distributing and marketing foods in a particular region, conveying information to consumers about where their food comes from so that they can make purchases to support their local economy.¹³⁵ The US Secretary of Agriculture has described local and regional food systems as one of 'the four pillars of agriculture and rural economic development', alongside 'production agriculture'.¹³⁶ While 'production agriculture' tends to focus on large-scale production and growing the nation's agricultural exports¹³⁷, local and regional food systems provide opportunities for large, medium and small farms to sell into local markets.¹³⁸

It has been estimated that the value of local food sales in the USA was around US\$6.1 billion in 2012, and that around 7.8% of farms were marketing foods locally.¹³⁹ Local food sales in the United States have grown rapidly over the last decade as table 5 below illustrates.

Indicator	Timeframe	No. Years	% Increase
Direct-to-consumer sales	97/98 - 2007	10	54%
No. farms selling some or all produce in local /regional markets	2010 - 2012	2	19%
Farmers' Markets	2001-2010	9	59%
No. of farm to school programs	2004/5 - 2007	3	81%

Table 5: Growth in local food sales in the USA. Sourced from Rose and Larsen (2013)¹⁴⁰

Local and regional food systems are less mature in Australia than those in the USA and Europe. However, there has also been growth in local food sales in Australia. The number of farmers' markets in Australia more than doubled between 2004 and 2011 to 150.¹⁴¹ National consumer research suggests that around 14% of Australians sometimes shop at farmers' markets for vegetables, and around 4% buy direct from growers at the farmgate and roadside stalls.¹⁴²

The opportunities for growing regional economies by strengthening local and regional food systems have received little attention in an Australian context. These opportunities have been better documented in the USA and Canada, where local and regional food systems have been shown to increase farm revenue, create jobs and 'multiply' economic impacts by retaining money in the local economy.¹⁴³ Table 6 (on the following page) summarises some of these economic benefits.

134 OSISDC (2010) Inquiry into the Sustainable Development of Agribusiness in Outer Suburban Melbourne, p121.

135 USDA (2016) Know your farmer, know your food compass. Washington DC: United States Department of Agriculture.

136 USDA (2015) Fact sheet: The four pillars of agriculture and rural economic development. Release no. 0142.15. 20 May 2015. United States Department of Agriculture.

137 USDA (2015) As above.

138 USDA (2016) As above.

139 Low, S., Adalja, A., Beaulieu, E., Key, N, Martinez, S., Melton, A., Perez, A., Ralston, K., Stewart, H., Suttles, S, Vogel, S. and Jablonski, B. (2015). Trends in U.S. Local and Regional Food Systems, AP-068. Washington DC: U.S. Department of Agriculture, Economic Research Service.

140 Rose, N. & Larsen, K. (2013), Economic Benefits of 'Creative Food Economies': Evidence, Case Studies and Actions for Southern Melbourne, Victorian Eco-Innovation Lab for the Southern Melbourne Regional Development Authority.

141 DAFF (2012) Australian Food statistics 2010-11. Canberra: Department of Agriculture, Fisheries and Forestry.

142 Research by Colmar Brunton, cited in AusFoodNews (2014) More Australians shopping for fresh vegetables at farmers' markets, 'local' food trend grows. Australian Food News, 24 March 2014.

143 Rose, N., and Larsen, K. (2013) As above.

Benefit	Findings
Job Creation	<p>More jobs are generated from fruit and vegetable farms [in the US] selling into local and regional markets than those not engaged in local food sales. Those selling locally employed 13 fulltime workers per \$US1 million in revenue earned, for a total of 61,000 jobs in 2008. Those not selling locally employed 3 fulltime workers per \$US1 million in revenue.¹⁴⁴</p> <p>Employment growth in Toronto's creative food cluster rose from \$45,000 in 1999, to \$58,000 in 2008 – expected to reach 10% per annum over the next decade.¹⁴⁵</p>
Multiplier Effect	<p>The percentage of money spent in local businesses that is retained in the local economy is typically in excess of 50%, compared to around 15-30% of money spent in non-local businesses.¹⁴⁶</p> <p>Spending in smaller independent local food outlets supports three times the number of jobs than at national grocery chains: outlets selling significant to high percentages of local food support on average one job for every £46,000 of annual turnover; by comparison, at three national chains one job is supported per £138,000 to £144,000 of annual turnover.¹⁴⁷</p>
Farm Viability	<p>Of the 110,000 US farms selling into local and regional markets in 2010, such sales accounted on average for 61% of total sales (for nearly two thirds of these local sales made up more than 75% of total sales).¹⁴⁸</p> <p>Especially important for horticulture: 'nearly 40 percent of all vegetable, fruit and nut farms in the US sell their products in local and regional markets.'¹⁴⁹</p> <p>Changing the incentive to farm: USA 2002-7, 300,000 new farms had commenced operation, with a net increase of 75,810 farms. The nature of the new farms was of smaller, more diversified production, being 'run by younger operators'.¹⁵⁰</p>

Table 6: Economic benefits of local and regional food systems. Table adapted from Rose and Larsen (2013)¹⁵¹

The USDA has also identified other benefits of strengthening local and regional food systems, including helping to preserve farmland (by improving the economic viability of urban fringe farms), increasing access to healthy food (by expanding the availability of fruit and vegetables through alternative retail outlets), creating opportunities for disadvantaged farmers and increasing the diversity and resilience of supply chains.¹⁵²

144 USDA Economic Research Service (2011) Direct and Intermediated Marketing of Local Foods in the United States. November 2011, ERS Report No.128, cited in Rose, N. and Larsen, K. (2013)

145 Ajayi, J., Denson, C., Heath, B., and Wilmot, K., (2010) 2010 Toronto Food Sector Update. University of Toronto / City of Toronto Economic Development & Culture, Toronto, Ontario, cited in Rose, N. and Larsen, K. (2013) As above.

146 Mitchell, S (2011) Key Studies: Why Local Matters, Institute for Local Self-Reliance, cited in Rose, N., and Larsen, K. (2013) As above.

147 CPRE (2012) From field to fork: The value of England's local food webs. Campaign to Protect Rural England.

148 USDA (2011) Local Foods Are Working for the Nation – Nov 2011. <http://blogs.usda.gov/2011/11/08/new-report-local-foods-are-working-for-the-nation/>.

149 USDA (2011) As above.

150 USDA (2009) News Release No.0036.09, 4.2.09, available at <http://www.usda.gov/wps/portal/usda/usdahome?contentidonly=true&contentid=2009/02/0036.xml>.

151 Table modified from Rose, N. & Larsen, K. (2013), As above.

152 USDA (2016) As above.

The potential economic benefits of growing demand for local food

Deloitte Access Economics¹⁵³ carried out an analysis for the Foodprint Melbourne project of the potential economic contribution of a 10% increase in preference for food sourced from Melbourne's foodbowl within the population of the foodbowl region.¹⁵⁴ This is one of the first attempts to quantify the potential economic benefits of growing a regional food economy in an Australian context.

The scenario explored by Deloitte Access Economics assumed that the population within Melbourne's foodbowl increased their preference for buying 'local' food from Melbourne's foodbowl by 10% for most food groups, such as fruits, vegetables, meats, eggs and dairy (excluding commoditised foods where source is difficult to trace like cereals, oil seeds and legumes). The scenario also assumed that this 10% increase in demand for food from Melbourne's foodbowl would drive a 10% increase in food produced in the foodbowl, and that capacity exists in the foodbowl to increase agricultural output by 10% through intensifying production on existing land and ensuring access to all the necessary inputs and infrastructure (the assumption that the foodbowl's output can be increased by 10% has not been otherwise verified).

The analysis found that a 10% increase in demand for food from Melbourne's foodbowl within the foodbowl region would contribute an additional \$290 million per annum to the regional economy from increased agricultural output, and a further \$131 million in agricultural value-add. An additional 1,183 new jobs in agriculture (FTE equivalent) would also be created, a significant (15%) increase on the 7,687 FTEs currently directly employed in the sector.

Under this scenario, the farmgate prices of food produced within Melbourne's foodbowl would also increase by 5.29%, reflecting the higher demand and price premium for food grown there and creating a greater incentive to farm in the foodbowl.

A 10% increase in demand for food from Melbourne's foodbowl within the foodbowl region would contribute an additional \$290 million per annum to the regional economy.

153 Deloitte Access Economics (2016) As above.

154 Other aspects of the Foodprint Melbourne project have modeled food demand for the population of Greater Melbourne, which corresponds roughly to the 'Inner foodbowl' region of Melbourne's foodbowl (see figure 2 on pg 27)

The analysis found that an increase in demand for local food could also lead to a small increase in the price of foods from Melbourne's foodbowl, although considerably less than 5.29% as food grown in the foodbowl is assumed to make up a relatively small share of the food consumed in Melbourne and because the farmgate price accounts for only a small part of the retail price of most foods. In mainstream supply chains, the proportion of the retail price paid by the consumer that goes to the producer has fallen sharply.¹⁵⁵ Most of the cost of food is now attributed elsewhere in the supply chain – in processing, wholesale mark-up, retail mark-up, packaging, marketing and transport. For some processed livestock products, the share of the retail price that goes to farmers can be as little as 10%.¹⁵⁶ An increase in the farmgate price would therefore benefit farmers but make a relatively small difference to the retail price. Some supply chain costs (e.g. transportation) may also be reduced if more of the produce from Melbourne's foodbowl is provided directly to customers in the regional food economy.

It should be noted that this scenario was independent of the additional scenarios analysed by Deloitte Access Economics about the potential economic impacts of loss of farmland to accommodate a Melbourne population of 7 million (see section 5.1). The capacity to increase agricultural output from Melbourne's foodbowl by 10% has not been verified for any of these scenarios. However, greater loss of agricultural land in Melbourne's foodbowl to urban sprawl is likely reduce the potential to increase agricultural output from the foodbowl to meet an increase in demand. For further details of the methodology and results of this analysis, see the report by Deloitte Access Economics.¹⁵⁷

¹⁵⁵ Nous Group (2015), Contemporary business strategies and learning models in the agrifood industry, AgriFood Skills Australia. Canberra: Agrifood Skills Australia.

¹⁵⁶ ACCC (2008), Report of the ACCC Inquiry into the Competitiveness of Retail Prices for Standard Groceries, Australian Competition and Consumer Commission, Canberra, cited in Deloitte (2016), p23

¹⁵⁷ Deloitte Access Economics (2016) As above.





SECTION 5

Risks to Melbourne's foodbowl

Melbourne's foodbowl makes an important contribution to the city's food security and its regional economy (see section 4). However, its productive capacity and sustainability is at risk from a number of emerging and increasing challenges that include loss of farmland, pressures on farming, water scarcity and high levels of food waste. This section explores these risks and their potential impact on Melbourne's foodbowl and food security. It also considers opportunities to reduce the risks and increase the resilience of the city's foodbowl.

One of the most significant risks to Melbourne's foodbowl is loss of farmland due to urban expansion.

5.1 Loss of farmland

One of the most significant risks to Melbourne's foodbowl is loss of farmland due to urban expansion.¹⁵⁸ Melbourne is the fastest growing city in Australia.¹⁵⁹ It is predicted to become a city of 7-8 million people by around 2050, and is expected to outstrip Sydney to become Australia's largest city by 2061.¹⁶⁰

Melbourne's population growth has historically occurred through significant expansion of the urban fringe at low rates of urban density. Between 2001 and 2011, 62% of Melbourne's population growth occurred in the city's outer suburbs, which are dominated by large, detached houses.¹⁶¹ In 2014-15, most of Melbourne's growth occurred on greenfield developments to the West, North and South-East of the city.¹⁶² Many of these new greenfield developments are in areas of Greater Melbourne that are important for horticultural production, such as Wyndham to the West and Casey-Cardinia to the South-East.

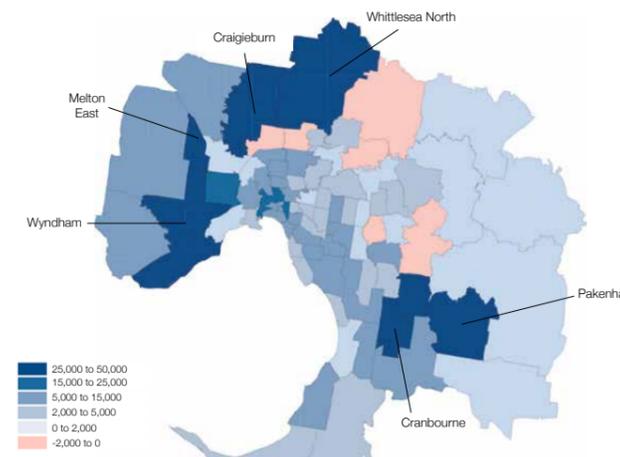


Figure 5: Population change for Statistical Local Areas, Melbourne, 2001 to 2011. Figure sourced from BITRE (2013).¹⁶¹

¹⁵⁸ Sheridan, J., Carey, R. and Candy, S. (2016) Melbourne's footprint: what does it take to feed a city? Victorian Eco-Innovation Lab, The University of Melbourne.

¹⁵⁹ ABS (2016a) cat. no. 3218.0 Regional population growth, Australia 2014-15. Canberra: Australian Bureau of Statistics.

¹⁶⁰ Department of Infrastructure and Regional Development (2015) State of Australian Cities 2014-2015: Progress in Australian Regions. Canberra: Department of Infrastructure and Regional Development.

¹⁶¹ BITRE (2013) Population growth, jobs growth and commuting flows – a comparison of Australia's four largest cities. Bureau of Infrastructure, Transport and Regional Economics. Canberra: BITRE. Notes: Based on 2006 ASGC Statistical Division boundaries. Estimates for 2007 to 2011 remain preliminary.

¹⁶² ABS (2016a) As above.

The loss of Melbourne's foodbowl is not inevitable as the city grows.

There have been a number of attempts to limit Melbourne's urban sprawl, including the introduction of 'Green Wedges' and urban growth corridors in 1971, and the creation of a legislated Urban Growth Boundary (UGB) in 2002 (see section 6.3). However, Melbourne's UGB has been expanded several times since its introduction – leading to the loss of around 55,000 hectares of land between 2005 and 2010¹⁶³ - and it has failed to provide a 'hard' edge to the city.¹⁶⁴

The first phase of the Foodprint Melbourne project highlighted that if Melbourne's growth continues to follow this long term trend – with the majority of population growth on the urban fringe at a low rate of urban density - then the capacity of Melbourne's foodbowl to meet the city's overall food needs could fall from 41% to around 18% by 2050.¹⁶⁵ Vegetable production in the city's foodbowl could be particularly severely affected due to loss of horticultural land, reducing the capacity of the city's foodbowl to meet Melbourne's vegetable needs from 82% to around 21%.

However, the loss of Melbourne's foodbowl is not inevitable as the city grows. The following sections explore the potential impact on Melbourne's foodbowl of limiting the loss of agricultural land by setting stronger targets for increased infill of existing residential areas, higher rates of urban density and by limiting urban expansion to the existing urban growth corridors (without further expanding the UGB).

The following sections are based on an economic analysis of Melbourne's foodbowl carried out by Deloitte Access Economics for the Foodprint Melbourne project.¹⁶⁶ This economic analysis explored the impact of two potential future land loss scenarios to accommodate a Melbourne population of 7 million people. The two land loss scenarios modeled by Deloitte Access Economics were informed by previous research on Melbourne's urban development by Michael Buxton and colleagues at the Centre for Urban Research, RMIT University.¹⁶⁷ Both scenarios represent a significantly lower proportion of population growth in Melbourne's outer suburbs (and greater infill of existing residential areas) than that achieved from 2001 to 2011.¹⁶⁸

163 Cook, N. and Harder, S. (2013) By accident or design? Peri-urban planning and the protection of productive land on the urban fringe. In: Farmar-Bowers, Q., Higgins, V. and Millar, J. (eds) Food security in Australia: Challenges and prospects for the future. New York: Springer .

164 Buxton, M. and Carey, R. (2014) The Use of Planning Provisions and Legislation to Protect Peri-Urban Agricultural Land, Australian Environment Review, September 2014: 191-195.

165 Sheridan, J., Larsen, K and Carey, R. (2015) Melbourne's foodbowl: Melbourne at 7 million. Victorian Eco-Innovation Lab, The University of Melbourne.

166 Deloitte Access Economics (2016) The economic contribution of Melbourne's foodbowl: A report for the Foodprint Melbourne project, University of Melbourne. Melbourne: Deloitte Access Economics.

167 Buxton, M., Hurley, J. and Phelan, K. (2015) Melbourne at 8 million: Matching land supply to dwelling demand. Melbourne: RMIT University.

168 BITRE (2013) As above.

The Moderate Urban Sprawl scenario models an infill rate of existing residential areas of 61% (with 39% of population growth in the outer suburbs), as proposed in Plan Melbourne¹⁶⁹, and an average site density in new areas of 15 lots per hectare. The Constrained Urban Sprawl scenario models an aspirational infill rate of 79% (with 21% of population growth in the outer suburbs), as proposed by Buxton and colleagues¹⁷⁰, and a site density in new areas of 25 lots per hectare. The assumptions underpinning the two scenarios are presented in table 7 below.

Commodity group	Constrained urban sprawl scenario	Moderate urban sprawl scenario
Population growth (additional people)	2.4 million	2.4 million
Infill rate (%)	79%	61%
Average site density in new areas (lots per hectare)	25	15
Gross density in new areas (dwellings per hectare)	15.5	9.3
Persons per dwelling	2.95	2.95
Additional dwellings required in growth (number)	169,000	314,000
Land required for new developments (hectares)	10,897	33,730

Table 7: Assumptions for Moderate and Constrained urban sprawl scenarios¹⁷¹

Moderate urban sprawl

The Moderate Urban Sprawl scenario led to:

- A reduction in the value of agricultural output from Melbourne's foodbowl of \$111 million per annum
- A decrease in the output of the food manufacturing sector in the foodbowl of an additional \$38 million per annum, due to the decline in agricultural output
- A total reduction in Gross Regional Product (GRP) from Melbourne's foodbowl of \$122 million per annum¹⁷²

If this reduction in the annual GRP of Melbourne's foodbowl were to continue over 20 years (e.g. from 2050 to 2070), the cumulative loss in value would amount to \$1.33 billion. This is a best case scenario, because population growth and urban development would likely continue to increase over 20 years, leading to greater impact on agricultural production and on Melbourne's regional economy.

169 Department of Transport, Planning and Local Infrastructure (2014) Plan Melbourne: Metropolitan Planning Strategy. Melbourne: Victorian Government.

170 Buxton, M., Hurley, J. and Phelan, K. (2016) As above.

171 Further details of the scenarios and research methodology can be found in Deloitte Access Economics (2016) As above. Note: Gross density includes surrounding open space, commercial properties and infrastructure required in new development areas. Site-to-gross density was calculated from the average of ten new residential sites.

172 The total reduction in GRP also includes impacts on additional sectors, such as transport, construction, water, waste and electricity.

The issue is not whether farmland will be lost on Melbourne's fringe to accommodate future population growth, but how much and with what impacts?

The Moderate Urban Sprawl scenario also led to an increase in farmgate prices in Melbourne's foodbowl of 1.13%, due to the decrease in production and increase in demand for food (from the growing population). This increase in farmgate prices would also lead to higher fresh food prices for consumers. The full increase in farmgate prices would not be passed on to consumers, because farmgate prices are only one component of retail prices and because food in stores also comes from sources other than Melbourne's foodbowl.¹⁷³ However, fresh food prices are also likely to come under increasing pressure in future from other challenges to food production, both in Melbourne's foodbowl and in the foodbowls of Australia's other state capitals (see section 3).

Constrained urban sprawl

The aspirational targets for infill of existing residential areas and urban density in the Constrained Urban Sprawl scenario (see previous page) led to some loss of agricultural land in Melbourne's foodbowl and some reduction in the foodbowl's economic output, but considerably less than in the Moderate Urban Sprawl scenario. The Constrained Urban Sprawl scenario led to:

- A reduction in the value of agricultural output from Melbourne's foodbowl of \$32 million per annum (compared to \$111 million for the Moderate Urban Sprawl scenario)
- A fall in the output of the food manufacturing sector in the foodbowl of \$11 million per annum (compared to \$38 million for the Moderate Urban Sprawl scenario)
- A total reduction in annual GRP from Melbourne's foodbowl of \$35 million per annum¹⁷⁴ (compared to \$122 million per annum for the Moderate Urban Sprawl scenario)

If the reduction in the annual GRP of Melbourne's foodbowl were to continue over 20 years, the cumulative impact on Melbourne's regional food economy would be a reduction in GRP of \$376 million (compared to \$1.33 billion for the Moderate Urban Sprawl scenario). The impact on farmgate prices, and follow on impact on fresh food prices for consumers, would also be considerably lower - a rise in farmgate prices of 0.3%, compared to 1.13% for the Moderate Urban Growth scenario.

¹⁷³ Deloitte Access Economics (2016) As above.

¹⁷⁴ The total reduction in GRP also includes impacts on additional sectors, as described above.

Limiting the impact of urban growth on Melbourne's foodbowl

Both of the scenarios accommodated a population of 7 million but led to some loss of agricultural land, with impacts on agricultural production and the economic contribution of Melbourne's foodbowl. In other words, the issue is not whether farmland will be lost on Melbourne's fringe to accommodate future population growth, but how much and with what impacts? However, the impact on agricultural production and the regional economy would be significantly less under the Constrained Urban Sprawl scenario than the Moderate Urban Sprawl scenario, as would the potential impact on food prices, highlighting the importance of setting strong aspirational targets for infill of existing residential areas and increased urban density. Increasing urban density will require a shift to higher density forms of housing, such as units, apartments, flats and semi-detached houses, accelerating a recent rise in these forms of housing in inner Melbourne suburbs.¹⁷⁵

The results of the scenarios also emphasise the importance of limiting urban growth to within Melbourne's existing growth corridors and fixing the UGB. Both scenarios assume that a future population of 7 million will be accommodated within the city's existing growth corridors. Buxton and colleagues¹⁷⁶ have demonstrated that a population of up to 8 million can be accommodated within the city's existing growth corridors, and it is recognised that there is at least a 30-year supply of urban-zoned land on the city fringe.¹⁷⁷ Under the Constrained Urban Growth scenario, the existing supply of urban-zoned land would last longer and could enable more land to remain in food production for a longer period, moderating negative impacts on the city's food security and the regional economy.

The findings of these land loss scenarios also highlight the importance of identifying and protecting areas of high value agricultural land on Melbourne's fringe. Which farmland is lost and where it is lost to accommodate urban expansion can make a significant difference to the impact on Melbourne's foodbowl. The Constrained Urban Growth scenario led to a reduction in agricultural output of \$32 million per annum from the loss of around 10,897 hectares of land in Melbourne's growth corridors. However, the loss of agricultural output and impact on Melbourne's regional economy could be significantly higher from the loss of a much smaller amount of land if the land were lost in an area of intensive horticultural production such as Werribee South or Casey-Cardinia. In 2015-16, Werribee South generated an agricultural output of \$80 million from just 3,275 hectares of land (see the Werribee South case study for further information).

¹⁷⁵ BITRE (2013) As above.

¹⁷⁶ Buxton, M., Hurley, J. and Phelan, K. (2015) As above.

¹⁷⁷ Department of Transport, Planning and Local Infrastructure (2014) As above.

The results emphasise the importance of limiting urban growth to within Melbourne's existing growth corridors and fixing the UGB.

Case study: Werribee South

Werribee South is an area of intensive horticultural production 30 km to the west of Melbourne that grows around 10% of Victoria's vegetables, including 85% of the cauliflower grown in Victoria, 53% of the broccoli and 34% of the lettuce.¹⁷⁸

In 2015-16, Werribee South generated \$80 million of agricultural output and provided 295 jobs¹⁷⁹ from just 3,275 hectares of agricultural land.¹⁸⁰ A number of other industries in the Wyndham area are also heavily dependent on agriculture in Werribee South - particularly, wholesale trade, transport and warehousing – which account for a further \$47 million in annual output and an additional 150 jobs.¹⁸¹

The majority of agriculture at Werribee South takes place in the Werribee Irrigation District, which is adjacent to the Western Treatment Plant and has access to recycled water, allowing the region to continue growing vegetables during drought. This enabled production to continue in the region during the height of the Millennium Drought.¹⁸² If Werribee South were to be lost as an area of agricultural production, it would have a significant impact on the regional economy, jobs and Melbourne's food security.

¹⁷⁸ Sheridan, J., Larsen, K. and Carey, R. (2015) Melbourne's foodbowl: Now and at 7 million. Victorian Eco-Innovation Lab, The University of Melbourne.

¹⁷⁹ Data draws on REMPLAN output and employment reports for April 2016 provided by Wyndham City.

¹⁸⁰ ABS (2013) cat. no. 7121.0 Agricultural Commodities Australia, 2010-11. Summary for Werribee South (SA2). Canberra: Australian Bureau of Statistics.

¹⁸¹ Data draws on REMPLAN output and employment reports for April 2016 provided by Wyndham City.

¹⁸² Sheridan, J., Carey, R. and Candy, S. (2016) Melbourne's footprint: What does it take to feed a city? Victorian Eco-Innovation Lab, The University of Melbourne.

5.2 Who's Going to Farm?

Protecting farmland is essential to create a resilient foodbowl for Melbourne, but not in itself sufficient. Without farmers, there will be no one to produce food in the city's foodbowl. Australia's farming sector is undergoing rapid change, and these changes are evident in Melbourne's foodbowl. Major shifts in Australian agriculture include:

- A demographic shift, with many ageing farmers on smaller properties and fewer younger farmers
- Pressures on farm viability, driven by shifts in market power and higher input costs
- Agricultural land being valued well beyond its production value, so that it is difficult for farmers to access land

Who is farming?

The age profile of farmers has changed significantly over the past few decades, with the proportion of farmers aged 55 years and over increasing from 26% to 47% between 1981 and 2011. This has been coupled with a fall in the proportion and number of younger farmers, with the total number of farmers aged under 35 years falling by 75% since 1976. In 2011, the median age of farmers was 53 years, and just 13% of farmers were under 35.¹⁸³

Factors driving this reduction in the number of younger farmers include:¹⁸⁴

- Farm consolidation, which reduces the number of farms and the opportunities for young people to enter agriculture
- A decrease in the recruitment of farmers under 25, due to general ageing of the workforce and later entry to the workforce
- A slowdown in the rate of those aged over 65 exiting farming¹⁸⁵, which may be related to a reduced interest from younger generations in returning to family farms

Younger farmers are more likely to be employed on larger, more productive farms, and older farmers are more concentrated on farms turning over less than \$100,000 per year.¹⁸⁶ There is some debate about whether a reduction in the number of younger farmers has implications for food security, as larger farms produce the majority of food.¹⁸⁷ However, encouraging small-scale, intensive production in Melbourne's foodbowl alongside high volume agricultural production could grow the regional food economy (see section 4), as well as increasing the diversity and resilience of production and supply chains (see section 3).

¹⁸³ ABS (2012), cat. no. 4102.0 Australian Social Trends – Australian Farming and Farmers. Canberra: Australian Bureau of Statistics.

¹⁸⁴ Barr, N. (2014) New entrants to Australian agricultural industries Where are the young farmers? RIRDC No. 14/003.

¹⁸⁵ Productivity Commission (2005) Trends in Australian Agriculture, Research Paper. Canberra: Productivity Commission.

¹⁸⁶ Barr, N. (2014) As above.

¹⁸⁷ Barr, N. (2014) As above.

Without farmers, there will be no one to farm in the city's foodbowl.

The Australian farming sector has come under increasing pressure over the last two decades.

Farm viability

The Australian farming sector has come under increasing pressure over the last two decades from ongoing structural change and from challenges to farm profitability. Challenges to farm profitability have been driven particularly by the rising cost of inputs – such as fuel, fertilisers and pesticides - and the growing market power of the major retailers, which has put downward pressure on farmgate prices.¹⁸⁸

These pressures on farm profitability put particular stress on farms in Melbourne’s foodbowl. Farms in Melbourne’s foodbowl range from small to large scale, but there is a relatively high proportion of small-scale farms.¹⁸⁹ Indeed, the majority of Australia’s farms are comparatively small. In 2010-11, 55% of Australia’s farms generated an agricultural output valued at less than \$100,000 and 36% of farms were smaller than 50 hectares.¹⁹⁰ However, the proportion of small farms is decreasing and the number of large farms is increasing as farms consolidate in response to structural pressures on the industry. Over the twenty years to 2002-03, there was a 23% increase in the average farm size and the number of ‘really large’ farms (with output valued at over \$200,000) doubled.¹⁹¹ These very large farms are also producing more of Australia’s food. Over 50% of agricultural output is produced from just 10% of farm businesses.¹⁹²

Farms in Melbourne’s foodbowl may have difficulty expanding to achieve economies of scale, due to the limited availability and high cost of land, and because of land fragmentation (sub-division of land into smaller blocks). Additional pressures on farms in the foodbowl include the high cost of property rates and conflict with non-farming neighbours over farm practices.¹⁹³ Melbourne’s foodbowl also has a relatively high number of ‘lifestyle’ landowners, which puts pressure on land prices, leads to land use conflict and reduces the productive capacity of the foodbowl.¹⁹⁴

Nous¹⁹⁵ identifies two viable strategies for profitable farming in Australia in view of current pressures on the industry. The first is the high volume production seen in very large farms. The second is a strategy of ‘niche production of differentiated products’ that targets markets that value provenance, potentially capturing a price premium. Another way of describing this second strategy is to focus on the ‘local or regional food

economy’, selling directly to consumers or through “values-based supply chains” (see section 4.3).¹⁹⁶ Nous argues that farmers who do not adopt either of these two strategies of high volume production or differentiated marketing fall into a ‘middle ground’ of low value, non-differentiated products that is becoming increasingly unviable.

The relationship between these two strategies is shown in Figure 6. While many of Australia’s farmers are likely to focus on high volume production, niche production that focuses on selling into local and regional markets provides a viable strategy for small-scale farmers. It has the potential to be an important strategy for farmers in Melbourne’s foodbowl, many of whom farm at small scale and have limited opportunity to expand their operations.

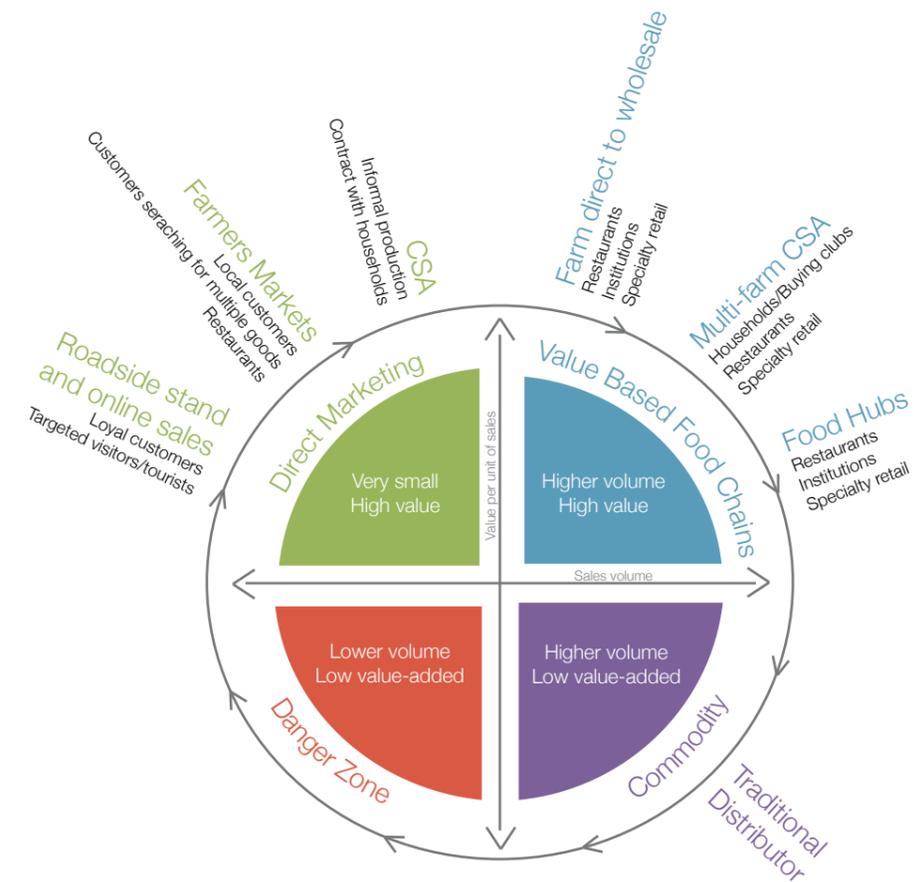


Figure 6: Typology of Value Creation Strategies. Adapted from Bauman et al (2015).¹⁹⁷

188 Nous Group (2015), Contemporary business strategies and learning models in the agrifood industry, AgriFood Skills Australia. Canberra: Agrifood Skills Australia.
 189 Parbery, P., Wilkinson, R. and Karunaratne, K. (2008) Square pegs in green wedges: landholders and natural resource management in Melbourne’s rural hinterland.
 190 ABS (2012) As above.
 191 Productivity Commission (2005) As above, p23.
 192 Productivity Commission (2005) As above.
 193 OSISDC (2010) As above.
 194 OSISDC (2010) As above.
 195 Nous Group (2015) As above.

196 Rose, N., and Larsen, K. (2013) Economic Benefits of ‘Creative Food Economies’: Evidence, Case Studies and Actions for Southern Melbourne, Victorian Eco-Innovation Lab for the Southern Melbourne RDA.
 197 Adapted from Bauman, A., Shideler, D., Thilmany, D., Taylor, M. & Angelo, B., (2015) An Evolving Classification Scheme of Local Food Business Models. Oklahoma State University and Colorado State University, published on eXtension.org.

The high market value of farmland in Melbourne's foodbowl creates a barrier for new farmers to take up farming in the region.

A resilient city foodbowl will have representation from both high volume producers and smaller producers. Melbourne's foodbowl offers significant advantages for smaller, differentiated producers, because of the opportunity to build strong relationships with consumers. Geographic proximity creates opportunities for direct sales and on-farm activities like U-pick and agritourism. There is evidence to suggest that around 23% of farms in Melbourne's 'Green Wedges' are engaged in some of these activities.¹⁹⁸ Farms that market direct to consumers are often focused on innovative sustainable farming practices and high levels of animal welfare.¹⁹⁹ There are aspects of small to medium sized farms that can also increase their flexibility and resilience and therefore contribute to the resilience of the overall food supply. They include localised knowledge and skills, relatively low overhead costs and high farmer motivation.²⁰⁰

Barriers to accessing farmland

The high market value of farmland in Melbourne's foodbowl creates a barrier for new farmers to take up farming in the region. The market value of farmland in the foodbowl is inflated by sub-division of the land into smaller lots, demand from lifestyle land-owners and speculative investment in anticipation of urban re-zoning (see section 5.1).²⁰¹ There is evidence that large areas of rural land adjacent to Melbourne's Urban Growth Boundary have been 'optioned' by developers.²⁰² New or young farmers who want to establish farms in Melbourne's foodbowl must compete for the land with developers, lifestyle land-owners and other buyers. However, the high value of the land reduces the relative rate of return from agriculture.

The average turnover for farming in Melbourne's foodbowl is around \$1,085 per acre per year for agriculture overall and \$10,585 per acre per year for vegetables.²⁰³ However, land values close to the Urban Growth Boundary on Melbourne's fringe, in areas such as Clyde and Werribee South, show a significant disconnect between the productive and market value of the farmland.²⁰⁴

Ageing farmers who occupy the 'middle ground' of low value and relatively unprofitable production in Melbourne's foodbowl are likely to consider selling their farms. They may view their farms as a form of capital investment, have little or no other superannuation and understandably be interested in maximising the return from their properties.²⁰⁵

198 OSISDC (2010) As above.

199 OSISDC (2010) As above.

200 McKinna, 2010; Keogh, 2013e, In: Nous (2015) As above p12.

201 Buxton, M., Carey, R. and Phelan, K. (2016) The Role of Peri-Urban Land Use Planning in Resilient Urban Agriculture: A Case Study of Melbourne, Australia. In Maheshwari, B, Singh, V and Thoradeniya, B (eds) *Balanced Urban Development: Options and Strategies for Liveable Cities*. Springer.

202 OSISDC (2010) As above.

203 Calculated using ABS (2016b), cat. no. 7121.0 Agricultural Commodities, Australia, 2014-2015 and ABS (2016c) cat.no. 7503.0 - Value of Agricultural Commodities Produced, Australia, 2014. Canberra: Australian Bureau of Statistics.

204 See, for example, properties advertised in these areas on www.ruralview.com.au and www.realestate.com.au.

205 OSISDC (2010) As above, p144.

Strategies to increase the resilience of Melbourne's foodbowl will need to address the issues of farm profitability and the inflated value of farmland in multiple ways – breaking the cycle of speculative investment, introducing initiatives that enable ageing farmers to transition out of farming, and also making it easier for new farmers to access farmland in Melbourne's foodbowl (see section 6.3). Most importantly, initiatives are needed to help farmers to capture a greater share of the food dollar by selling produce from Melbourne's foodbowl into local and regional markets (section 6.3).

5.3 Water scarcity

Southeast Australia is a water scarce region.²⁰⁶ Climate change is likely to further reduce the amount of water available for agriculture through reduced rainfall, more frequent and severe droughts and the effects of a warming climate.²⁰⁷ Water availability for agriculture will also be reduced through increased demand for water, and the need to restore environmental flows in major river basins.²⁰⁸

The majority of agriculture in Victoria is dependent on rainfall. Just 5% of the state's agriculture is irrigated, and much of this occurs in the Murray Darling Basin, Australia's main area of food production, which has experienced significant over-extraction of irrigation water.²⁰⁹ The irrigation districts of the Murray-Darling Basin could experience a large reduction in water availability for food production as a result of climate change.²¹⁰

Some crops are highly dependent on irrigation – 84% of Victoria's area of fruit farming and 78% of the state's area of vegetable farming are irrigated.²¹¹ The impact of water scarcity on food supply and the economy became evident during the Millennium Drought (1996-2010), when food exports decreased (contributing to a drop in Australia's GDP) and food prices rose.²¹² Around 35,000 jobs were lost in the food and agricultural industries in Victoria between 1998-99 and 2001-02, primarily due to the drought.²¹³

206 Comprehensive Assessment of Water Management in Agriculture (2007) *Water for Food, Water for Life: A comprehensive Assessment of Water Management in Agriculture*. London: Earthscan, and Colombo: International Water Management Institute.

207 Hughes, L., Steffen, W., Rice, M., and Pearce, A. (2015) *Feeding a hungry nation: Climate change, food and farming in Australia*. Sydney: Climate Council of Australia.

208 Comprehensive Assessment of Water Management in Agriculture (2007) As above.

209 Garrick, D. (2015) *Water Allocation in Rivers Under Pressure*, Cheltenham, UK: Edward Elgar Publishing.

210 Hughes, L., Steffen, W., Rice, M., and Pearce, A. (2015). As above.

211 From ABS (2016d) cat. no. 4618.0 Victorian Water Use on Farms Canberra: Australian Bureau of Statistics.

212 Quiggin, J. (2007) *Drought, climate change, and food prices in Australia*. Brisbane: University of Queensland.

213 SGS Economics and Planning (2009) *Economic significance of the food sector*. Melbourne: SGS Economics and Planning.

There is a significant opportunity to increase the delivery of recycled water for agriculture in Melbourne's foodbowl.

Production in Melbourne's foodbowl was also affected during the Millennium Drought. Vegetable farmers in Bacchus Marsh came close to running out of water and were only able to continue production through 'emergency' water allocations.²¹⁴ Farmers in the Werribee Irrigation District, which produces around 10% of Victoria's vegetables²¹⁵, also came close to running out of water during the Millennium Drought, when use of groundwater was heavily restricted and river water allocations were reduced to less than 10% of their normal levels.²¹⁶ Vegetable farmers in the area were able to continue production during the drought as a result of investment in a recycled water scheme, which enabled them to switch to using recycled water from the nearby Western Treatment Plant.²¹⁷

The use of recycled water for irrigation in Melbourne's foodbowl has its challenges. They include matching the supply of recycled water with demand for irrigation (supply is often high outside of the growing season, when demand is low) and delivering recycled water of sufficient quality for food production. Salt levels in the recycled water delivered to farmers can be high, with impacts on soils and the appearance of some vegetables. This has been an issue in the Werribee Irrigation District, where high levels of salinity (from industry and domestic discharges) have made it difficult at times to deliver recycled water with low enough salt content for irrigation.²¹⁸ The high cost of recycled water has also been an issue for farmers.²¹⁹

Despite the challenges, there is a significant opportunity to increase the delivery of recycled water for agriculture in Melbourne's foodbowl. Successful schemes delivering recycled water for agriculture operate from Melbourne's two main water treatment plants, the Eastern and Western Water Treatment Plants, and also from the Boneo Treatment Plant on the Mornington Peninsula. However, following a 2014 upgrade of the Eastern Treatment Plant, there is considerable unused capacity to deliver recycled water for food production. Around 6% of the recycled water available from the Eastern and Western Treatment Plants is currently used for food production, while 84% is unused and disposed of at sea. Around 10% of this unused water would be enough to grow half of the vegetables needed to feed Melbourne.²²⁰

In order to deliver more recycled water to farmers, investment would be required in infrastructure to store recycled water produced outside the growing season and to pipe water to farmers.²²¹ However, investment in this infrastructure has the potential to increase the resilience of the city's food

214 Sobey, E. (2010) Moorabool Shire Council: Veggie industry collapse looms. The courier, 6 February 2010.

215 Sheridan, J., Larsen, K. and Carey, R. (2015) As above.

216 Southern Rural Water (2009) Regional Environment Improvement Plan Werribee Irrigation District Class A Recycled Water Scheme. Melbourne: Southern Rural Water.

217 Rodda, C. and Kent, M. (2008) Werribee Irrigation District Recycling Scheme: the First Years. Irrigation Australia Conference and Exhibition, Melbourne, Australia, 20-22 May 2008.

218 DSE (2005) Quality recycled water for the Werribee Plains: Salt reduction strategy. Melbourne: Department of Sustainability and Environment.

219 OSISDC (2010) As above.

220 Sheridan, J., Carey, R. and Candy, S. (2016) Melbourne's Foodprint: What does it take to feed a city? Melbourne: Victorian Eco-Innovation Lab.

221 Sheridan, J., Carey, R. and Candy, S. (2016) As above.

supply to future climate risks by 'drought proofing' areas of food production close to the city's water treatment plants (see section 6.3). Expanding the infrastructure to deliver recycled water to farmers could also reduce the demand on other sources of fresh water for irrigation and open up new areas of horticultural production, such as the proposed Bunyip Food Belt to the southeast of Melbourne.²²²

Investment in recycled water infrastructure has the potential to increase the resilience of the city's food supply by 'drought proofing' areas of food production.

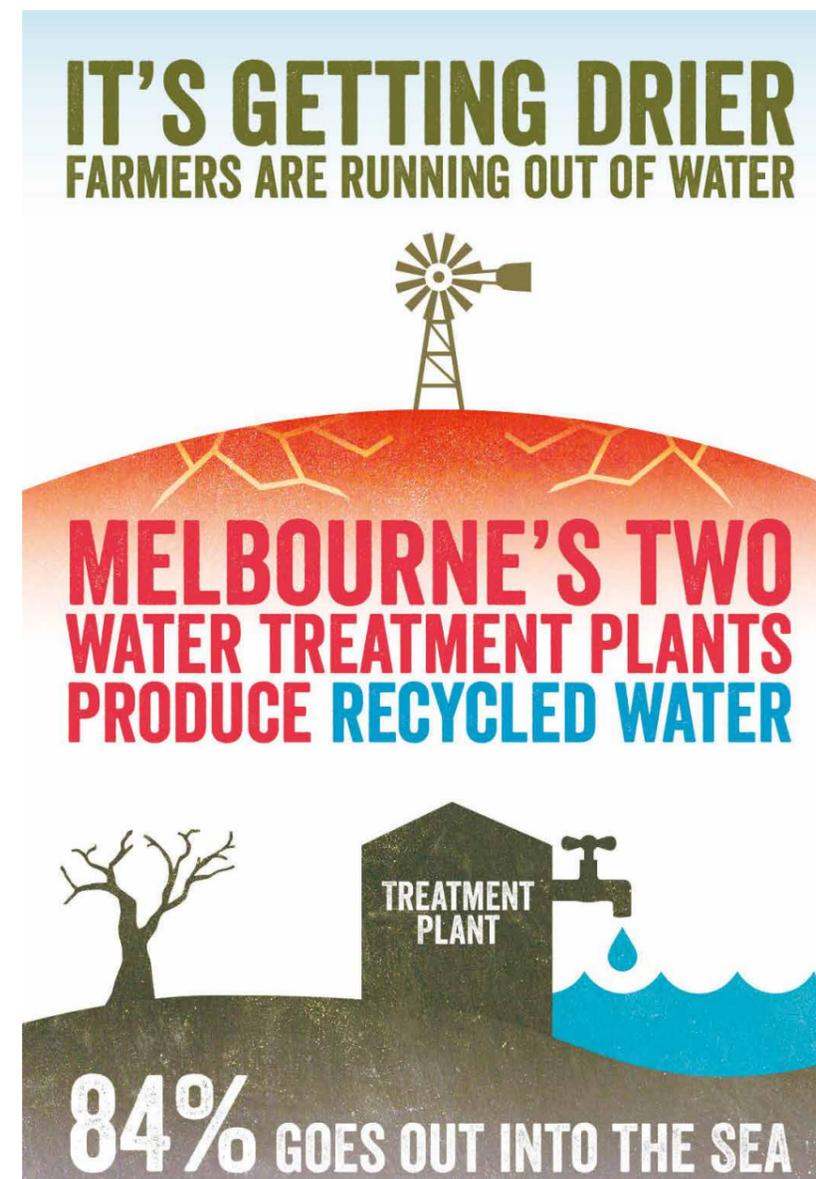


Figure 7: Excerpt from Foodprint Melbourne's recycled water infographic

222 The Bunyip Food Belt is an area of food production to the South-East of Melbourne. Local governments are exploring a proposal to develop the region as a key area of food production for metropolitan Melbourne that would be irrigated using class A recycled water from the Eastern Treatment Plant. For more information, see <https://www.casey.vic.gov.au/business/support/bunyip-food-belt>

Food waste undermines the long term resilience of the food system by placing additional pressure on the natural resources that underpin food production.

5.4 Food waste

Feeding Melbourne generates around 207 kilograms of food waste per person per year across the food supply chain (around 40% of this waste is 'post-consumer' waste from households, restaurants and cafes). Producing this wasted food uses around 3.6 million hectares of land, 180 gigalitres of water, and generates 1 million tonnes of greenhouse gases.²²³ This level of waste will be increasingly unsustainable in a resource and carbon-constrained future (see section 3.2).

Food waste occurs for different reasons at various stages of the food supply chain and for various types of food. For example, household food waste is a key cause of food waste for dairy and cereal grains (e.g. bread) in rich nations such as Australia, whereas a substantial amount of the food waste for fruit and vegetables occurs on-farm, due to the rejection of crops which fail to meet the strict product standards of food retailers.²²⁴ While the policy focus for reducing food waste is often on households, over 60% of food waste occurs at earlier stages in the food chain, on-farm and during food processing and distribution.²²⁵

The relationship between food waste and resilience of the food system is complex. At one level, over-production of food could be argued to increase resilience, as it generates surplus food that can provide a 'buffer' against disruptions to supply. However, food waste undermines the long-term resilience of the food system by placing additional pressure on the natural resources that underpin food production (such as land, water and fossil fuels)²²⁶, generating damaging greenhouse gas emissions and by undermining farmer profitability. The Foodprint Melbourne project has estimated that significant 'savings' in natural resources and greenhouse gas emissions could be made by reducing Melbourne's food waste.²²⁷

The significance of food waste in undermining the resilience and sustainability of the food system has been recognised in the new United Nations Sustainable Development Goals, which set a target to halve consumer and retail food waste by 2030 and to reduce food waste throughout the food supply chain.²²⁸ The Australian federal government is currently developing a national strategy on food waste²²⁹, and one of the four key objectives in Melbourne's Metropolitan Waste and Resources

²²³ Sheridan, J., Carey, R. and Candy, S. (2016) As above.

²²⁴ HLPE (2014) Food losses and waste in the context of sustainable food systems. A report by the High Level Panel of Experts on Food Security and Nutrition; FAO (2011) Global food waste and losses – extent, causes and prevention. Rome: Food and Agriculture Organization of the United Nations.

²²⁵ Sheridan, J., Carey, R. and Candy, S. (2016) As above.

²²⁶ European Commission (2014) Impact assessment on measures addressing food waste to complete SWD (2014) 207 regarding the review of EU waste management targets. Common staff working document. European Commission.

²²⁷ Sheridan, J., Carey, R. and Candy, S. (2016) As above.

²²⁸ United Nations General Assembly (2015) Resolution adopted by the General Assembly on 25 September 2015. Transforming our world: the 2030 agenda for sustainable development. New York: United Nations.

²²⁹ United Nations Information Centre Canberra (2015) Tripartisan support for food waste reduction. by Australian Political Parties announced at Think.Eat.Save event in Canberra, Australia. 4 June 2015. <http://un.org.au/2015/06/04/tripartisan-support-for-food-waste-reduction-by-australian-political-partiesannounced-at-think-eat-save-event-in-canberra-australia/> [accessed 22 April 2015].

Recovery Implementation Plan is to "reduce the environmental and community impact of organics in landfill by minimising food waste and by recovering more food and garden waste".²³⁰

City region food systems offer particular opportunities to reduce food waste and strengthen the resilience of the food system by harnessing city food waste as an alternative source of fertilisers (and animal feed) for nearby farms on the city fringe. Dependence on mostly imported synthetic fertilisers, particularly phosphorus, is a vulnerability in the city's food supply.²³¹ Supplies of fossil fuels that form the basis for nitrogen-based fertilisers are also declining.²³² Transforming city food waste into organic fertiliser could reduce dependence on conventional sources of fertilisers.

City region food systems also offer opportunities to find new markets for edible 'B grade' farm produce that fails to meet the strict product specification standards of retailers and might otherwise be wasted on farm. A key barrier to marketing 'B grade' produce in Victoria is the cost of packing and freighting, which may be more than the farmer receives for the produce.²³³ Creating new city markets for second grade produce from Melbourne's foodbowl has the potential to reduce on-farm food waste, improve farmer profitability and improve access to affordable fruit and vegetables for city consumers.

City region food systems offer opportunities to reduce food waste and strengthen the resilience of the food system by harnessing city food waste as an alternative source of fertilisers.

²³⁰ Metropolitan Waste and Resource Recovery Group (2016) Metropolitan waste and resource recovery implementation plan. Melbourne: Metropolitan Waste and Resource Recovery Group, p11.

²³¹ Cordell, D., Drangert, J. and White, S. (2009) The Story of Phosphorus: Global Food Security and Food for Thought. *Global Environmental Change* 19(2): 292-305.

²³² Dawson, C. and Hilton, J. (2011) Fertiliser availability in a resource-limited world. Production and recycling of nitrogen and phosphorus. *Food Policy* 36: 14-22.

²³³ Carey, R. and McConell, K. (2011) Fruit and vegetable roundtable summary: Addressing the barriers to a viable Victorian fruit and vegetable industry. Melbourne: Food Alliance.



SECTION 6

A resilient city foodbowl for Melbourne

The findings of the Foodprint Melbourne project have highlighted that Melbourne's foodbowl is an important building block in a resilient and sustainable food future for the city. This section presents a future vision for a resilient city foodbowl for Melbourne, based on the project's findings. It also outlines the key elements of a policy framework to achieve this vision, and it discusses a range of potential policy approaches.

6.1 Vision

A future vision for Melbourne's food system is described in the City of Melbourne's food policy, *Food City: A food system that is secure, healthy, sustainable, thriving and socially inclusive*.²³⁴

We present here a vision for a resilient city foodbowl that can support this broader vision for Melbourne's food system.

A resilient city foodbowl that:

- provides fresh, healthy food to meet the needs of Melbournians as the city grows
- fosters a vibrant regional food economy
- increases resilience to future food system stresses and shocks
- promotes sustainable food production and consumption, for current and future generations

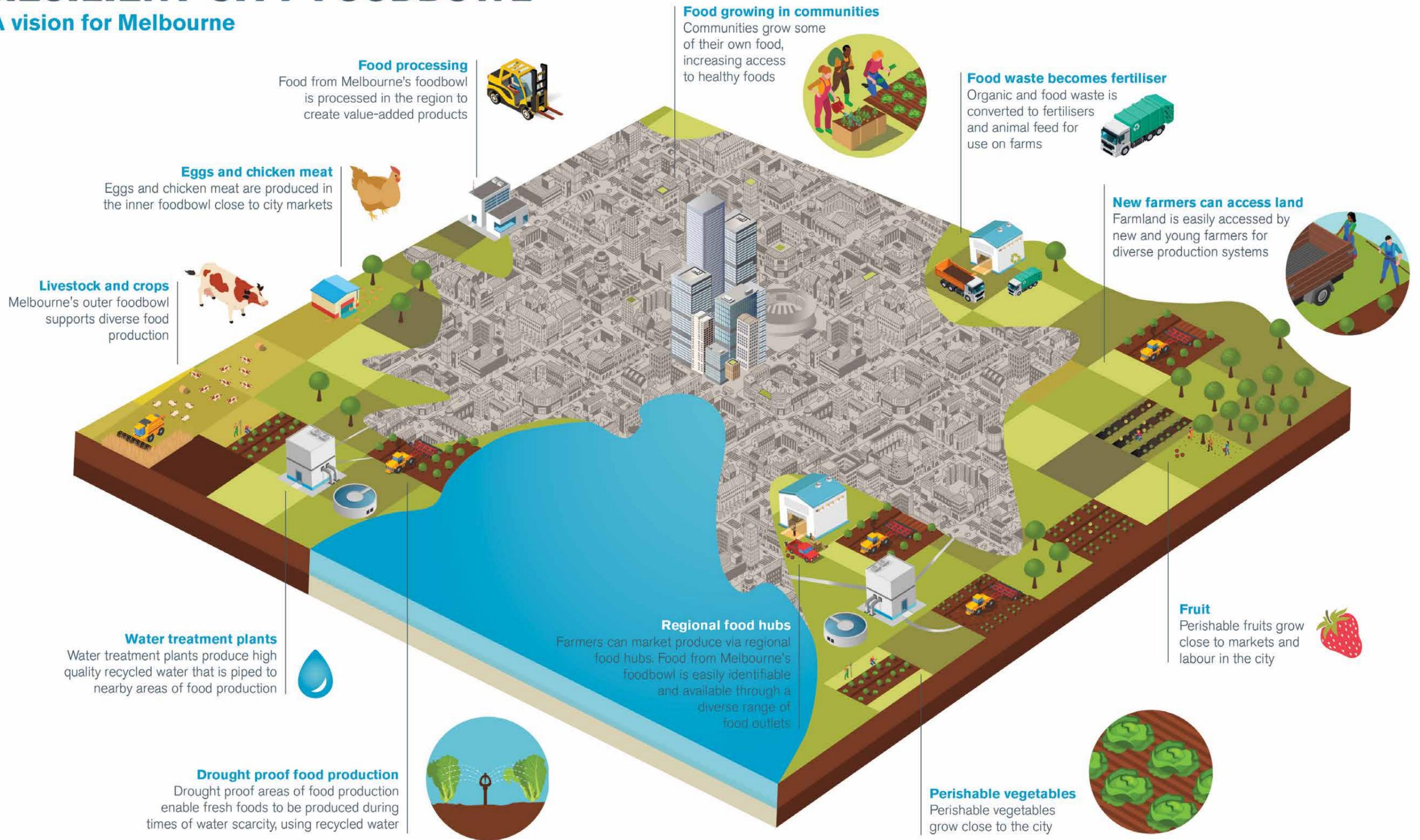
The infographic on the next page presents a visual concept of a resilient city foodbowl for Melbourne. In this vision, Melbourne retains its foodbowl farmland as a source of fresh, healthy food as the city grows. Highly perishable fruits and vegetables continue to grow close to the city in the inner foodbowl, while a wider variety of food is produced in the outer foodbowl. Farmers can bring produce grown in the foodbowl to regional food hubs, where it is sold on to local restaurants, hospitals and food outlets. Food produced in Melbourne's foodbowl is easy for consumers to identify and widely available through a diverse range of food outlets. Many Melbournians also grow some of their own food at home or in shared spaces, increasing their access to healthy food and also their awareness of how food is grown.

Food grown on the city fringe is processed within the foodbowl, adding value and creating more jobs. Innovative schemes are established to enable new farmers to begin farming in Melbourne's foodbowl, reducing barriers to land access. Infrastructure is expanded to deliver high quality recycled water to farmers from the city's water treatment plants, and areas of farmland close to the city's water treatment plants are protected and developed as 'drought proof' areas of food production. Infrastructure is also expanded to collect and process organic waste and food waste, turning it into fertilisers that can be used on farms. Harnessing waste streams in this way reduces the city's risk from the chronic stresses of water scarcity and declining supplies of conventional fertilisers, strengthening the city's food security.

²³⁴ City of Melbourne (2012) Food City: City of Melbourne Food Policy

RESILIENT CITY FOODBOWL

A vision for Melbourne



Planning to ensure a resilient city foodbowl will require a cross-sector policy approach that draws on the principles of food system planning.

6.2 An integrated policy framework

The findings of the Foodprint Melbourne project suggest that planning to ensure a resilient city foodbowl - and to achieve the vision presented in the previous section - will require a cross-sector policy approach that draws on the principles of food system planning.²³⁵ An effective policy approach will have the flexibility to make connections between policy areas that are typically addressed separately, but that need to be considered together in order to strengthen the city's food security.

An effective policy approach would consider how to protect agricultural land on the city fringe (land use planning policy), but also how to encourage farmers to continue actively farming the land in order to maintain the productive capacity of the foodbowl (agricultural policy). It would have the capacity to consider links between land use planning policy and water policy in order to recognise the particularly high value of fertile agricultural land that lies in close proximity to the city's water treatment plants. It would encourage growth of Melbourne's local and regional food economy (economic policy), but also consider how growing the local and regional food economy could support more diverse and resilient supply chains, making healthy food from Melbourne's foodbowl more available and accessible in the city.

This type of 'joined up' policy approach would involve multiple government portfolios (e.g. land use planning, water, agriculture and economic development) and multiple levels of government (local, state and federal). State and local government, in particular, have policy responsibilities and interests across each of these areas, and planning a resilient city foodbowl is likely to require close co-ordination between them. Increasing recognition that these challenges face all major Australian cities could also mean a case for Federal Government involvement. Planning a resilient city foodbowl is likely to require a collaborative approach that involves both government and non-government stakeholders across the food system and a mix of policy approaches that involve regulatory, co-regulatory and market-based solutions.

We present here a framework that brings together some of the elements that are likely to be necessary in planning a resilient city foodbowl – including protection of agricultural land, water security, farm profitability, strengthening the local and regional economy and reducing food waste. We do not recommend specific policy solutions here, as 'fit for purpose' policy solutions are likely to be best identified through a cross-sector and collaborative policy process that involves a wide range of stakeholders. Instead, we propose five overarching policy objectives that emerge from the findings of the Foodprint Melbourne project. These are key in planning for a resilient city foodbowl (they are described in the next section).

²³⁵ The American Planning Association describes food system planning as "multi-disciplinary and cross-divisional, involving issues related to the environment, transportation, social equity, public health, land use, and economic development" – APA food system planning white paper, prepared for the American Planning Association's Legislative and Governance Committee.

6.3 Potential policy approaches

There are a range of potential approaches to achieve the five proposed policy objectives, outlined in the table below. This section describes some of the possible policy approaches and presents 'best practice' examples of where some of these approaches have been used in Australia and around the world.

Policy objective	Potential policy approaches to achieve the objective
<p>Protect farmland in Melbourne's foodbowl</p> <p>Protect farmland in Melbourne's foodbowl as a source of fresh local food for current and future generations</p>	<ul style="list-style-type: none"> - Fix the Urban Growth Boundary as a hard boundary - Strengthen regulatory measures to reduce land fragmentation and prevent the introduction of urban-related land uses to non-urban areas - Reduce pressure on growth boundaries by increasing densities in new outer urban and established metropolitan areas and shift development pressure from the fringe to existing urban areas - Introduce a specific planning mechanism for areas of food production - Explore the potential of transferable development rights - Encourage the establishment of a farmland trust
<p>Encourage farmers to farm in Melbourne's foodbowl</p> <p>Make profitable farming in the foodbowl a reality for both existing and new farmers</p>	<ul style="list-style-type: none"> - Make it easier for new farmers to access land in the foodbowl, and support sustainable farming approaches - Recognise and reward the 'public good benefits' of farming in Melbourne's foodbowl e.g. ecosystem services - Reduce land use conflict through information provision, 'acceptable farm activities' policy amendments or right to farm approaches
<p>Grow a vibrant regional food economy</p> <p>Grow a vibrant food economy in Melbourne's foodbowl and create jobs by strengthening the farming, manufacturing, hospitality and agri-tourism sectors</p>	<ul style="list-style-type: none"> - Develop communications, marketing or labelling to promote food from Melbourne's foodbowl - Introduce a state government food procurement scheme that includes a preference for regionally produced food - Develop clusters and networks to support regionally-focused food production, processing and distribution enterprises - Consider developing 'Cottage Law' regulations appropriate for small scale producers and processors

Policy objective	Potential policy approaches to achieve the objective
<p>Reuse water to grow food in a drying climate</p> <p>Deliver more treated waste water to city fringe farmers to increase the capacity for fresh food production during drought</p>	<ul style="list-style-type: none"> - Invest in infrastructure to increase the delivery of recycled water to farmers - Set a target in state water policy for delivery of recycled water for agriculture - Establish 'drought proof' areas of food production in proximity to key water treatment plants - Explore options for potential use of stormwater in city fringe farming
<p>Reduce and reuse food waste and organic waste</p> <p>Harness city food waste and organic waste to generate an alternative supply of organic fertilisers as supplies of traditional fertilisers (fossil fuels and phosphate) decline</p>	<ul style="list-style-type: none"> - Invest in infrastructure to process city food waste and organic waste into animal feed and fertilisers for use on farm - Establish a grant scheme for innovative new enterprises that use second grade produce from Melbourne's foodbowl - Establish a food waste network that brings stakeholders from across Melbourne's food system together to tackle food waste

Protect farmland in Melbourne's foodbowl

Policy objective

Protect farmland in Melbourne's foodbowl

Protect farmland in Melbourne's foodbowl as a source of fresh local food for current and future generations

Potential policy approaches to achieve the objective

- Fix the Urban Growth Boundary as a hard boundary
- Strengthen regulatory measures to reduce land fragmentation and prevent the introduction of urban-related land uses to non-urban areas
- Reduce pressure on growth boundaries by increasing densities in new outer urban and established metropolitan areas and shift development pressure from the fringe to existing urban areas
- Introduce a specific planning mechanism for areas of food production
- Explore the potential of transferable development rights
- Encourage the establishment of a farmland trust

Effective protection of city fringe farmland is one of the most important steps for Melbourne to strengthen the resilience of its city foodbowl (see section 5.1). Melbourne already has measures in place to protect farmland on the city fringe, including the 'Green Wedges', introduced in 1971, and a legislated Urban Growth Boundary (UGB), introduced in 2002.²³⁶ The Victorian State Planning Policy Framework also includes an objective for 'protection of agricultural land'.²³⁷ However, these measures have not proven effective in preventing continued loss of farmland or ending the cycle of land speculation.²³⁸

Land fragmentation is one of the main drivers of loss of farmland.²³⁹ The subdivision of large properties into smaller lots – which may function as lifestyle blocks or residential lots rather than commercial farms – drives up land prices and increases conflict between existing farmers and new residents, who may object to aspects of commercial farming practices. Higher land prices fuel land speculation and reduce the relative rate of return on investments in agriculture, further increasing pressure on farmers.²⁴⁰ Farmers may also view their city fringe farms as a form of capital investment that they hope to realise on retirement by selling their land for development.²⁴¹ As pressures on farmers increase due to land use conflicts and challenges to the economic viability of their farming operations (see section 5.2), the option of sub-dividing becomes more attractive.

²³⁶ Buxton, M. and Carey, R. (2014) The use of planning provisions and legislation to protect peri-urban agricultural land. Australian Environment Review. September 2014.

²³⁷ Clause 14.01-1 of the Victorian State Planning Policy Framework, Protection of Agricultural Land.

²³⁸ Buxton, M. and Carey, R. (2014) As above.

²³⁹ Buxton, M., Hurley, J. and Phelan, K. (2015) Melbourne at 8 million: Matching land supply to dwelling demand. Melbourne: RMIT University.

²⁴⁰ Buxton, M, Carey, R. and Phelan, K. (2016) As above.

²⁴¹ Wynne, L., Cordell, D., Chong, J. and Jacobs, B. (2016) Planning tools for strategic management of peri-urban food production. Sydney: RICS Research Trust.

Case study: Adelaide's Environment and Food Production Area

In April 2016, the South Australian state government introduced an Environment and Food Production Area (EFPA) for Greater Adelaide as part of the *Planning, Development and Infrastructure Act 2016*.²⁴² The main aim of the EFPA is to protect the city's foodbowl, landscape values and environmental resources from urban encroachment by creating a hard boundary to the city.

The EFPA also seeks to encourage more construction of new homes in existing urban areas in inner and middle ring suburbs to achieve a more compact city, with better access to public transport and infrastructure.²⁴³

The EFPA covers an area of around 800,000 hectares of rural land around Adelaide.²⁴⁴ A new State Planning Commission will have responsibility for protecting this area from urban encroachment, and future changes to the EFPA will require the agreement of both Houses of Parliament to encourage more transparent decision making about development on the urban fringe.²⁴⁵

Some stakeholders have expressed concern that the EFPA could drive up property prices in Greater Adelaide. However, modeling by the Department of Planning, Transport and Infrastructure (DPTI) indicates that there is currently an estimated 25-37 year supply of land for housing in fringe and township areas outside of the EFPA. The DPTI has also stressed the importance of creating more affordable living options within existing urban areas.

²⁴² Planning, Development and Infrastructure Act 2016 - Sect 7 Environment and food production areas. South Australia. Version 21.4.2016.

²⁴³ Holderhead, S (2015) Planning minister John Rau releases map of environment and food protection areas forming boundary around Greater Adelaide. The Advertiser 2 December 2016.

²⁴⁴ Holderhead, S (2015) As above.

²⁴⁵ Department of Planning, Transport and Infrastructure (2016) Proposed Environment and Food Production Area (EFPA). Accessed 25/10/16 from: http://dpti.sa.gov.au/_data/assets/pdf_file/0019/252523/Proposed_Environment_and_Food_Production_Area_V3_3.pdf

A key challenge in ensuring long term protection of farmland in Melbourne's foodbowl is to break the cycle of speculative investment in land.

A key challenge in ensuring long term protection of farmland in Melbourne's foodbowl is to break the cycle of speculative investment in land. Regulatory controls to reduce land fragmentation include measures to limit sub-division and the construction of dwellings on subdivided lots. Controls on non-farming related commercial uses of land in peri-urban areas also have a role in stabilising land prices and reducing land use conflict.²⁴⁶ Other potential regulatory measures to protect farmland include the use of agriculture- or food-specific planning zones, such as the Environment and Food Production Areas introduced by the South Australian government to protect farmland and environmental resources around Adelaide (see case Study).²⁴⁷ Such approaches place primary emphasis on permanently protecting food producing areas instead of regarding fringe metropolitan areas as 'land in waiting' for future urban development.

The findings of the Foodprint Melbourne project highlight the importance of fixing the UGB and limiting development to the existing growth corridors. Creating a genuine 'hard boundary' to the city (that is not subject to frequent reviews and expansion) could reduce development expectations and land speculation in the areas bordering the UGB. Development policies within the UGB should be integrated with protection measures for the foodbowl and should seek to prevent constant rezoning of green belt land. Increased densities in urban growth corridors, and shifting a proportion of business-as-usual outer urban development to the established metropolis, would also reduce pressure on the UGB.

The issue of housing affordability has been raised as an argument for increasing land supply on the city fringe, which could lead to further expansion of the UGB.²⁴⁸ However, Plan Melbourne emphasises that there is already a minimum of 30 years supply of urban-zoned land on Melbourne's fringe, and that a key issue in housing affordability is greater availability of a diversity of housing types.²⁴⁹ Others have also emphasised that affordable housing should be considered within the broader context of affordable living, including the ongoing costs of living in an area.²⁵⁰ An important aspect of affordable living is affordable food, and this project has demonstrated the potential for loss of farmland in Melbourne's foodbowl to contribute to rising food prices (see section 5.1).

246 Buxton, M Carey, R. and Phelan, K. (2016) As above

247 DPTI (2015) Proposed Environment and Food Production Area. Adelaide: Department of Planning, Transport and Infrastructure

248 Hon Scott Morrison MP, Treasurer of the Commonwealth of Australia (2016) Keeping home ownership within reach – address to the Urban Development Institute of Australia (UDIA). Sydney. Media release 24 October 2016.

249 Department of Transport, Planning and Local Infrastructure (2014) As above.

250 DPTI (2015) As above; Daley, J., Hurley, J., Gurrin, N., Goodman, R. and Rowley, S. (2016) Solutions beyond supply to the housing affordability problem. The Conversation 24 October 2016.

Case study: Vancouver

Vancouver has a comprehensive and world leading approach to protecting the productive capacity of land on its city fringe. The city's approach encompasses a number of different elements, including strong protection for agricultural land, measures to promote viable agriculture and incentives to encourage new farmers.

In 1973, the province of British Columbia introduced legislation to establish an Agricultural Land Reserve (ALR) after significant loss of farmland around the city. The ALR is administered by an independent commission - the Agricultural Land Commission - and protects around 4.7 million hectares of farmland through a special land use zone.²⁵¹ In 1996, the province also introduced the Farm Practices Protection (Right to Farm) Act (RSBC 1996), which protects farmers from 'nuisance lawsuits' arising from normal farm practices on land zoned for agricultural use.²⁵²

The city's regional growth strategy, Metro Vancouver 2040, includes food as a key theme alongside issues such as 'affordable housing' and 'growth management, and includes a strategy to "promote the supply of agricultural land and promote agricultural viability with an emphasis on food production".²⁵³ This strategy is underpinned by a regional food system action plan, with actions that focus on investing in a new generation of food producers, strengthening the capacity to process and distribute local foods and increasing opportunities for direct marketing of local foods, in addition to protecting the city's farmland.²⁵⁴

Vancouver has a food policy council, comprised of individuals from all sectors of the regional food system, including both government and non-government stakeholders, that works together to improve the sustainability of Vancouver's food system.²⁵⁵ It also has a city food strategy, with underlying principles that include supporting sustainable agriculture, preserving farmland resources and supporting regional farmers and food producers.²⁵⁶

251 Agricultural Land Commission (2016) ALR history. British Columbia: Agricultural Land Commission. Available <http://www.alc.gov.bc.ca/alc/content/alr-maps/alr-history> (accessed on 14 November 2016)

252 British Columbia Farm Practices Protection Right to Farm Act (RSBC 1996) – Available: http://www.bclaws.ca/civix/document/id/consol14/consol14/00_96131_01 (accessed on 14 November 2016)

253 Metro Vancouver (2015) Metro Vancouver 2040: Shaping our future. Regional growth strategy. Bylaw No. 1136, 2010. Vancouver: Metro Vancouver.

254 Metro Vancouver (2016) Regional food system action plan 2016. Vancouver: Metro Vancouver.

255 City of Vancouver (2016) Vancouver Food Policy Council. Available: <http://vancouver.ca/your-government/vancouver-food-policy-council.aspx> (accessed on 14 November 2016)

256 City of Vancouver (2013) What feeds us: Vancouver food strategy. January 2013. Vancouver: City of Vancouver.

Greater public and political consensus is required about the need to protect the city's foodbowl.

A number of market-based mechanisms are also available to protect farmland. Transferable development rights (TDR) schemes have been widely used in the United States, but are uncommon in Australia.²⁵⁷ TDRs incentivise farmers and developers to protect agricultural land by giving landowners development 'rights' that they can sell to developers. If a farmer sells a right to a developer, the farm is placed under a covenant that permanently restricts any future development, while the developer receives a right to develop at increased density that can be used in an area designated for urban development.²⁵⁸ TDRs have the benefit of compensating farmers for the ecosystem services that they provide and enabling them to realise capital, although there is some evidence that the schemes can be difficult to implement in practice.²⁵⁹

Farmland trusts are another mechanism widely used in the United States and Canada, but little known in Australia. Farmland trusts are not-for-profit organisations that aim to protect farmland from development by purchasing conservation easements on farms. Farmers receive a cash payment for easements in exchange for accepting permanent restrictions on future development rights. Some trusts also work with farmers to help them access available farmland.²⁶⁰

Whatever mix of approaches is used to protect farmland on Melbourne's fringe, greater public and political consensus is required about the need to protect the city's foodbowl. Cities that have been particularly effective in protecting urban fringe farmland – such as Portland (Oregon), Toronto and Vancouver (see the case study) – have established a broad public and political consensus that enabled them to maintain these policies over the long term.²⁶¹ New approaches to valuing farmland that provide a fuller assessment of the benefits of city fringe agriculture could support the development of a broader consensus. The Sydney Food Futures project has developed a framework that identifies five categories of benefits from city fringe agriculture – food security, emissions and waste, ecosystem, urban liveability and socio-economic benefits.²⁶²

257 Harman, B., Pruetz, R. and Houston, P. (2015) Tradeable development rights to protect peri-urban areas: lessons from the United States and observations on Australian practice. *Journal of Environmental Planning and Management*. 58(2): 357-381.

258 Harman, B. and Choy, D. (2011) Perspectives on tradeable development rights for ecosystem service protection: lessons from an Australian peri-urban region. *Journal of Environmental Planning and Management*. 54(5): 617-635.

259 Harman, B., Pruetz, R. and Houston, P. (2015) As above.

260 National Young Farmers Coalition (2015) Finding farmland: A farmer's guide to working with land trusts. January 2015. Hudson: National Young Farmers Coalition.

261 Buxton, M. and Carey, R. (2014) As above.

262 Wynne, L., Cordell, D., Chong, J. and Jacobs, B. (2016) As above.



Encourage farmers to farm in Melbourne's foodbowl

Policy objective

Encourage farmers to farm in Melbourne's foodbowl

Make profitable farming in the foodbowl a reality for both existing and new farmers

Potential policy approaches to achieve the objective

- Make it easier for new farmers to access land in the foodbowl, and support sustainable farming approaches
- Recognise and reward the 'public good benefits' of farming in Melbourne's foodbowl e.g. ecosystem services
- Reduce land use conflict through information provision, 'acceptable farm activities' policy amendments or right to farm approaches

This project has highlighted that a resilient city foodbowl with strong food production capacity delivers significant public benefits (see section 4). Delivering these public benefits will require viable and thriving farm businesses. In addition to the general challenges facing agriculture in Australia, farmers in Melbourne's foodbowl face specific barriers to farming, such as the high cost of land and the challenges to farming at large scale.

Farmers in Melbourne's foodbowl bear the additional costs of farming in a city foodbowl in order to deliver these public benefits. Making it easier to farm in the foodbowl could help to address this balance and encourage farmers to farm in the region. There are also potential advantages to farming in Melbourne's foodbowl, including the availability of recycled water, the potential to harness organic waste for use on farms, and proximity to consumers in local markets who have an interest in sustainably-produced and source-identified local produce. Policy responses that leverage these opportunities are outlined in other sections. This section focuses specifically on policy measures that might encourage farmers to farm in Melbourne's foodbowl, particularly:

- Developing pathways for new sustainable farmers and farms to underpin emerging opportunities in the local and regional food economy
- Recognising and rewarding the public good benefits of farming in Melbourne's foodbowl
- Reducing conflict between farming and urban or rural lifestyle neighbours

Pathways to farming in the foodbowl

There is evidence of an increased interest in agricultural careers in Australia from students who are "deeply engaged with issues of food security and climate change and how to feed our growing world."²⁶³ The opportunities to connect with engaged consumers in city foodbowls could be attractive to these new entrants to farming. However, it can be particularly difficult for new farmers to access land in city foodbowls, due to higher land costs. There are opportunities to make underutilised farmland in Melbourne's foodbowl more accessible to young and new farmers, which include:

- Purchasable Development Rights, which are land purchase arrangements that enable land to be made available to new entrants at lower cost, such as the local 'millage' tax in Ann Arbor (Michigan), which has protected 2,000 acres of farmland and open space and leveraged over US\$12 million in grants²⁶⁴
- Existing stamp duty exemptions for young farmers (under the age of 35) buying their first farm.²⁶⁵ It may be possible to extend these exemptions to counter speculative pricing in the foodbowl
- Establishment of brokering services (such as FarmLINK²⁶⁶ – see case study) to facilitate leasing and share farming
- Information and support services to simplify the establishment and increase the success rate of new farming enterprises. This can include support for sustainable production and landscape management, as well as marketing and distribution e.g. how to connect to the local and regional food economy
- Zoning and purchase of land that creates buffer zones for small scale farming, and/or farm incubators

There are opportunities to make underutilised farmland in Melbourne's foodbowl more accessible to young and new farmers.

²⁶³ Parkinson, E. (2016) Agriculture degree programs on the rise at universities, Australian Financial Review, 17 February 2017, <http://www.afr.com/news/special-reports/industry-trends/agriculture-degree-programs-on-the-rise-at-universities-20160215-gmv242#ixzz4OoPyeUIH>

²⁶⁴ Rose, N., and Larsen, K. (2013) Economic Benefits of 'Creative Food Economies': Evidence, Case Studies and Actions for Southern Melbourne, Victorian Eco-Innovation Lab for the Southern Melbourne Regional Development Authority.

²⁶⁵ State Revenue Office (2016) Young farmer duty exemption or concession <http://www.sro.vic.gov.au/node/1428>

²⁶⁶ OSISDC (2010) As above, recommendation 12, 9155

Case study: FarmLINK

FarmLINK connects new farmers with land, mentorship opportunities and resources through a variety of web-based initiatives. Farm owners with land available for rent or sale, or with expertise to share, are put in touch with new farmers looking for land and mentorship. The website acts as a 'match-making' service between new farmers and the resources that they need.

For example, FarmLINK Ontario²⁶⁷ offers farming workshops on irrigating, planting, harvesting techniques and other skill-based learning opportunities that new farmers benefit from. At the other end of the farming workforce cycle, the Californian FarmLink²⁶⁸ program helps farmers nearing retirement to plan for succession or to find other options where in-family succession isn't possible.

Some FarmLINK websites not only offer resources for new farmers, but also offer opportunities for more experienced farmers to guide new farmers into the profession. A number of these FarmLINK programs work alongside initiatives such as Growing New Farmers²⁶⁹ and offer teaching resources, along with resources for more experienced farmers to develop their own teaching and mentoring skills.²⁷⁰

However, the main barrier that these websites help new farmers to overcome is that of getting access to land. Some of the programs offer assistance with creating leasing agreements or lease-to-own agreements. Others offer a wider range of land transfer models. For example, New England Landlink covers seven states in the northeast of the United States and helps farmers to transfer land through sales, rentals, leases, lease to eventual sale, and work-in models (similar to share-farming).²⁷¹

267 See <https://www.farmlink.net/en/index.html>

268 See <http://www.californiafarmlink.org/>

269 http://www.smallfarm.org/main/special_projects/growing_new_farmers/

270 See http://www.smallfarm.org/main/for_on_farm_mentors/

271 See more about New England Landlink here: http://www.smallfarm.org/main/for_new_farmers/new_england_landlink/

'New Farmer Incubators' and networks are emerging around the world to provide opportunities for new farmers to increase their skills, while also enabling them to reduce and share the costs of getting started in farming (see the case study on the highly successful Farm Incubator at the Intervale Centre in Vermont). The potential for this kind of initiative has been recognised in the USA through the creation of the USA National Incubator Farm Training Initiative, which provides tools and resources to set up Incubator Farms.²⁷²

Farmer Incubator is a not-for-profit organisation that has been providing similar support for small, independent farmers in Melbourne's foodbowl since 2013. They assist young people with an interest in farming, but for whom the high cost and risk of farming are 'impassable barriers', to start their own ventures. They have secured four 'farmlets' in Melbourne and its surrounding foodbowl and have run two rounds of their cooperative farm training program Pop-up Garlic Farmers, and two rounds of their agribusiness program Pomodoro People.²⁷³

Recognising and rewarding public good benefits

There are opportunities to recognise and invest in provision of farm services that go above and beyond food production and provide broader benefits to the community, such as eco-system services or agri-tourism and recreational services (e.g. walking and cycling paths through farmland).²⁷⁴ For example, Hume's Land Management Rate Rebate Schemes provide a 23% reduction on rates payable for farms that protect native vegetation, manage weeds, prevent soil erosion and control animal pests. Smaller parcels of non-farm land are eligible for a 15% reduction.²⁷⁵

The rates paid by farmers in Melbourne's foodbowl can be affected by the speculative value of the land. Differential rates could be applied to reduce costs on land that is being 'actively' farmed or 'sustainably' farmed. Examples include the Yarra Ranges Farm Land Differential Rate which reduces rates by 30% on land being used primarily for farming²⁷⁶, and the Woodbury County (Iowa) Property Tax Break for landowners converting to organic farming.²⁷⁷ It may also be possible to develop differential rates schemes that reduce the benefits of land-banking or create a financial incentive to make land-banked land available for farming through favourable lease agreements.

There are opportunities to invest in provision of farm services that go above and beyond food production and provide services to the community.

272 See National Farmer Incubator Training Initiative <http://nesfp.org/food-systems/national-incubator-farm-training-initiative>

273 See Farmer Incubator (2016) <https://farmerincubator.org/>

274 Parbery, P (2009), As above, p5

275 City of Hume (n.d.) Land Management Rate Rebate Schemes, https://www.hume.vic.gov.au/files/sharedassets/hume_website/environment/land_management_rate_rebate_schemes.pdf

276 Yarra Ranges Shire (2016) Farm Land differential rates, <http://www.yarraranges.vic.gov.au/Property/Rates/Understanding-property-rates-charges/Farm-Land-differential-rates>

277 For discussion of lessons from this particular measure, see Schweser & Schwartx (2013) Local Food Policy: Lessons Learned from Woodbury County, Iowa, University of Minnesota Extension, Regional Sustainable Development Partnerships

Case study: Intervale Center

The Intervale Center is a non-profit organisation in Burlington, Vermont that aims to serve as a successful model of a community food system.²⁷⁸ It has turned abandoned land into a food and farming hub that now farms 135 acres and sells half a million dollars of local food to the community and local institutions.²⁷⁹ The regeneration began with a composting project that rebuilt depleted soils, forming the foundation for a diverse range of enterprises and programs.²⁸⁰

The Intervale Center runs one of the first farm incubator programs in the United States. Their Farms Program leases small incubator farms to new farmers, enabling them to share resources and lease equipment, greenhouses, irrigation and storage facilities (with the Center covering 20% of fees).²⁸¹ They reduce barriers to starting farms by providing subsidised rental rates, business planning support and mentorship from established growers. The Intervale Center also currently leases land to seven mentor farms. These farms serve as established businesses that provide mentorship to the incubator farms and leadership in the agricultural community.²⁸²

The Intervale Center's farms produce fresh produce, eggs, meat, and flowers for the local community and contribute 60 full-time, part-time and seasonal jobs to the Burlington economy. Each year, between one and three new farm businesses join the program as incubators.²⁸³ Established farms are then helped to transition to their own independent farm site. The Farms Program is now sharing their experience of setting up farm incubators as a founding member of the National Incubator Farm Training Initiative.²⁸⁴

278 Berman, E., (2011) Creating a Community Food System: The Intervale Center (<http://www.intervale.org>), University Libraries Faculty and Staff Publications. Paper 32

279 Foodtank (2016) Strengthening Community Food Systems: An Interview with Mandy Fischer, foodtank.com

280 Find out more about the Intervale Centre here: <http://www.intervale.org>

281 Intervale Center (2010) Independent Farms in the Intervale. Cited in Berman (2001) As above

282 Intervale Centre (2016) Farms Program, <http://www.intervale.org/what-we-do/farms-program>

283 Intervale Centre (2016) As above

284 <http://nesfp.org/food-systems/national-incubator-farm-training-initiative>

Reducing land use conflict

Investigations into the viability of agribusiness in Melbourne's foodbowl, such as the 2010 Outer Suburban/Interface Services and Development Committee (OSISDC) Inquiry into Sustainable Development of Agribusiness in Outer Suburban Melbourne, and Parbery (2008)²⁸⁵, have identified a range of policy responses to improve operating conditions for agribusiness in Melbourne's foodbowl. Many of the recommendations from the 2010 OSISDC Inquiry are relevant and are referred to throughout.

A major challenge to farming in foodbowl areas is the increased conflict between existing farms and new residents, who may object to neighbouring farm practices. 'Nuisance' complaints from neighbours can seek to reduce or restrict pre-existing agricultural activities. A common response to this issue has been to strengthen the farmers' 'right to farm' through legislation, an approach particularly widespread in the USA, where every state has adopted some kind of 'right to farm' law or policy.²⁸⁶

Tasmania is the first Australian state to legislate right to farm laws. NSW has also adopted a right to farm policy, not yet legislated.²⁸⁷ The pre-existing right to farm is implicitly recognised in the Victorian Sale of Land Act 1962 (Section 32), which states that "the property may be located in an area where commercial agricultural production activity may affect your enjoyment of the property. It is therefore in your interest to undertake an investigation of the possible amenity and other impacts from nearby properties and the agricultural practices and processes conducted there".²⁸⁸ This places the onus on the buyer to check whether the pre-existing agricultural use will affect them, potentially undermining the legitimacy of later nuisance complaints – while not actually preventing them. More specific recognition of farming activity can be included in individual councils' planning schemes.²⁸⁹ Recommendations from the OSISDC Inquiry suggested that farmers' "right to use accepted farming practices" may require strengthening.²⁹⁰

285 Parbery, P. (2008) Square Pegs in Green Wedges: landholders and natural resource management in Melbourne's rural hinterland. summary report. Melbourne: Department of Primary Industries

286 Centner, T. J. (2007) Governments and Unconstitutional Takings: When Do Right-To-Farm Laws Go Too Far?, 87(May), cited in Wynne, L., Cordell, D., Chong, J. and Jacobs, B. (2016) Planning Tools for Strategic Management of Peri-Urban Food Production, Report for Royal Institution of Chartered Surveyors, p28

287 Wynne, L., Cordell, D., Chong, J. and Jacobs, B. (2016) p28

288 Sale of Land Act 1962, No. 6975 of 1962, p59, S32, cited in VFF (2009) Submission to Inquiry into the Sustainable Development of Agribusiness in Outer Suburban Melbourne, Victorian Farmers Federation, January 2009

289 Victorian Planning and Environment Act (1987)

290 OSISDC (2010) As above

While 'right to farm' approaches can reduce the impact on farmers from nuisance complaints, they may have unintended consequences, such as placing neighbours in a position where they have no right of protection from new or intensifying agricultural practices. Some stakeholders have suggested that an effective planning scheme, with permit requirements informed by clear and up-to-date understanding of 'reasonable' agricultural practices in different sectors, may be a preferable response.²⁹¹ The recent (October 2016) Victorian Government response to the Animal Industries Advisory Committee's Final Report acknowledges the possibility that intensification and change in technology may allow practice changes without a new planning permit, potentially subjecting neighbours to unreasonable conditions.²⁹² Information and support services that increase understanding of agricultural landscapes for new landholders may provide another approach to help reduce conflict.



291 Environmental Defenders Office (2014), EDO Tasmania submission – Primary Industry Activities Protection Act 1995. 2014. Environmental Defenders Office. Accessed: <http://www.edotas.org.au/wp-content/uploads/2013/10/140804-EDO-Tas-submission-re-PIAP-Act-Review.pdf>

292 Victorian Government (2016), Planning for sustainable animal industries, Victorian Government's response to the Animal Industries Advisory Committee's Final report, October 2016, p13

Grow a vibrant regional food economy

Building local markets for regionally produced food is essential to growing the local and regional food economy.

Policy objective	Potential policy approaches to achieve the objective
<p>Grow a vibrant regional food economy</p> <p>Grow a vibrant food economy in Melbourne's foodbowl and create jobs by strengthening the farming, manufacturing, hospitality and agri-tourism sectors</p>	<ul style="list-style-type: none"> - Develop communications, marketing or labelling to promote food from Melbourne's foodbowl - Introduce a state government food procurement scheme that includes a preference for regionally produced food - Develop clusters and networks to support regionally-focused food production, processing and distribution enterprises - Consider developing 'Cottage Law' regulations appropriate for small scale producers and processors

Food production in Melbourne's foodbowl could form the basis of a thriving local and regional food economy, in which food is produced, processed and retailed to consumers, businesses and other organisations in Melbourne. With a market of 4.4 million people, growing to at least 7 million by 2050, food producers in Melbourne's foodbowl have the potential to capture greater returns on the food they produce by selling to local markets, while also creating jobs on-farm and downstream in the supply chain.

Melbourne's local and regional food economy is still relatively immature compared to other regions of the world, such as the USA and Canada. Investment to grow local and regional food economies in these countries comes from government departments (see the case study on the Know Your Food, Know Your Farmer initiative), philanthropic organisations, not-for-profits, business and communities. A range of approaches are being applied to deliver multiple outcomes, including:

- Health and social equity benefits, through improved access to fresh, healthy food
- Improved environmental sustainability and land management outcomes, through environmentally-aware consumers supporting farmers with leading practices

In 2013, the Southern Melbourne RDA commissioned the Victorian Eco-Innovation Lab to explore opportunities and approaches to developing a regional food economy for Southern Melbourne (which includes the foodbowl areas of Casey, Cardinia and the Mornington Peninsula). They examined six world-leading case studies, identifying conditions for a strong local and regional food economy. Some key approaches to creating these conditions are described below, summarised as:

- Leadership and coordination
- Harnessing markets and driving demand
- Strengthening supply and access, business support and incubation, and ensuring appropriate-scale infrastructure
- Appropriate regulation
- Education, training and research

Strong local and regional food economies are based on a high-level, multi-stakeholder commitment to 'Building a Regional Food Economy'. Public authorities and agencies frequently partner with leading businesses and community representatives to articulate the multiple benefits of a regional food economy, and to develop and implement a plan of action. This is often done through the establishment of food policy councils, typically preceded or followed by the development of charters and strategies.²⁹³ In some cases, the strategies or key elements of them are legislated, such as the Illinois Local Food, Farms and Jobs Act.²⁹⁴ In Vermont, a grassroots movement worked with legislators to create the Farm to Plate Investment Program and the Vermont Sustainable Jobs Fund, which developed a comprehensive Farm to Plate Strategic Investment Plan.²⁹⁵

²⁹³ Rose, N., and Larsen, K. (2013) Economic Benefits of 'Creative Food Economies': Evidence, Case Studies and Actions for Southern Melbourne, Victorian Eco-Innovation Lab for the Southern Melbourne Regional Development Authority.

²⁹⁴ Illinois General Assembly Public Act 96-579, eff. 8-18-09., cited in (30 ILCS 595/) Local Food, Farms and Jobs Act. <http://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=3137&ChapterID=7>

²⁹⁵ See <http://www.vtfarmtoplate.com/getting-to-2020>.

Public procurement of regional food is a key element of leadership and demand generation in the regional food economy, enabling farms and food hubs to scale up their regional supply chains to meet demand. In the USA, at least 37 states have laws requiring some or all state and local agencies to preference food grown or processed in the state.²⁹⁶ Many cities and countries have similar policies (see the case study).

Building local markets for regionally produced food is essential to growing the local and regional food economy. This involves making it easy for consumers to identify food from the region and reducing barriers to convenient and affordable access. There is a plethora of approaches to increasing consumer recognition of regionally produced food, including:

- National quality and assessment marks, such as Local Food Plus²⁹⁷
- Consortia of co-branding schemes, which use nationally trusted 'brandmarks' to identify locally produced food e.g. the Buy Fresh Buy Local brand, which has over 60 local chapters across the USA²⁹⁸
- Regional brands developed alongside distribution infrastructure (e.g. brands for regional food hubs)
- Regional brands developed by groups of producers (often in areas that also have strong agri-tourism potential) e.g. in Melbourne's foodbowl, both the Yarra Valley²⁹⁹ and the Mornington Peninsula³⁰⁰ have developed co-branding and marketing strategies

The 2010 Victorian OSISDC Inquiry³⁰¹ recommended a campaign to build public awareness of Melbourne's 'Green Wedges'. One way of doing this would be to increase public recognition of the food and farmers in Green Wedge areas of Melbourne's foodbowl.

296 ChangeLab Solutions (2012), State Laws Promoting Use of Locally Grown Food and Agricultural Products in Public Contracts, http://www.changelabsolutions.org/sites/default/files/LocalFoodsStateLawsTable_FINAL_Rebranded.pdf Oakland, CA: ChangeLab Solutions.

297 See <http://www.ecolabelindex.com/ecolabel/lfp-certified> NB. Ceased operations in 2014

298 FoodRoutes Network (2016) How to start a buy fresh buy local program. <http://foodroutes.org/buy-fresh-buy-local-program/join/>

299 Yarra Valley Regional Food Group (2013) Discover a place of hidden delights. http://www.yarravalleyfood.com.au/hidden_delights.pdf

300 Mornington Peninsula Produce (2016) Your peninsula to plate guarantee. <http://www.mpproduce.com.au/>

301 OSISDC (2010) As above.

Case study: New York City State Food Purchasing Guidelines

In 2012, New York City became one of the first major cities to introduce an initiative that encourages city agencies and food services to procure more food produced in the local region.³⁰² Under the New York State Food Purchasing Guidelines³⁰³, city agencies can give preference to food products produced in New York State in their purchasing decisions, which helps stimulate New York State's food economy.

The guidelines allow city agencies to grant a 'price preference' for food from New York State by awarding contracts to bidders offering New York State food products if their price falls within 10% of the price of the lowest bidder. The guidelines also encourage city agencies to review menus in order to identify where current products could be replaced with a locally available alternative.

New York City has a significant budget for institutional meals, second only to the United States military. Each year the city spends over US\$175 million on food programs in senior citizens centres, schools and day care centres. The NYC Department of Education was one of the first city agencies to introduce regional food procurement, purchasing around US\$4.5 million of regional food between 2006 and 2009.³⁰⁴

By encouraging procurement of food produced in the local region, the city aims to strengthen regional supply chains, build the capacity of local producers and assist local producers to gain access to larger institutional buyers.

302 Office of the Mayor (2012) Mayor Bloomberg, Speaker Quinn and Deputy Mayor Gibbs Announce Local Food Procurement Guidelines - New York City is One of First Major Cities with Specific Local Food Initiatives. Press release. 12 June 2012.

303 New York State Food Purchasing Guidelines, 2015. Available: <http://www.nyc.gov/html/mocs/downloads/pdf/New%20York%20State%20Food%20Purchasing%20Guidelines.pdf>

304 New York City Council (2010) Foodworks: A vision to improve New York City's Food System. New York: New York City Council.

An effective local and regional food economy requires innovative enterprises that can deliver short distribution and value chains.

There are many supply-side challenges to meeting demand for regional food, including meeting the convenience and affordability requirements of consumers, and aggregating produce from small and seasonal suppliers to meet the purchasing requirements of large institutions. An effective local and regional food economy requires innovative enterprises that can deliver short distribution and value chains (such as Community Supported Agriculture, food cooperatives, farmers' markets and food hubs), and can establish relations of trust between enterprises and eaters, based on accountability and transparency.³⁰⁵ Support networks are needed to strengthen the enterprises that supply regional food. Examples include:

- Food business partnerships and networks, such as the Michigan Food Systems Economic Partnership³⁰⁶ to support new farmers and food entrepreneurs
- Food clusters and co-located incubators to provide mutual support, shared training and resources, such as the Detroit Eastern Market's Kitchen Connect program³⁰⁷
- Start-up accelerators, such as the City of Melbourne's Local Food Launchpad aimed at stimulating start-up local food enterprises³⁰⁸
- Farm to institution organisations and networks, working overcome barriers to unlock the multi-million dollar budgets of institutional purchasing³⁰⁹
- The USDA's Agricultural Marketing Service (AMS), which has an enormous array of information, services and supports to build regional food economies – accessible through the Know your Farmer, Know your Food initiative (see the case study)³¹⁰
- The UK's Making Local Food Work program, a 5-year philanthropic program to "improve the sustainability of community food enterprises that bring producers and consumers closer together"³¹¹
- The National Good Food Network's Food Hub information centre, which does research, runs webinars and conferences and runs a community of practice discussion group to build the capacity of food hubs³¹²
- In Victoria, the Department of Health has funded the Open Food Network to co-design and pilot a community food enterprise support service, due to be launched in early 2017

305 Rose, N. and Larsen, K. (2013) As above.

306 Fair Food Network (2016) Food System Economic Partnership. <http://www.fairfoodnetwork.org/list/food-system-economic-partnership>

307 See <https://detroitkitchenconnect.com/kitchen-users/>

308 Doing Something Good (2016) Local Food Launchpad <http://doingsomethinggood.com.au/local-food-launchpad-2016/>

309 For example, see. <http://www.farmtoinstitution.org/>

310 USDA (2016) Grants, loans, and other support <http://www.usda.gov/wps/portal/usda/knownyourfarmer?navid=kyf-grants>

311 Sustain The alliance for better food and farming (2016) Making local food work. <https://www.sustainweb.org/makinglocalfoodwork/>

312 National Good Food Network (2016) Food hubs center. <http://ngfn.org/resources/food-hubs/food-hubs>

Case study: Know Your Farmer, Know Your Food

The Know Your Farmer, Know Your Food initiative (KYF) was launched by the United States Department of Agriculture in 2009. It's a national initiative that aims to strengthen the connection between farmers and consumers in order to grow local and regional food economies, create jobs and increase access to healthy food.³¹³ It also aims to improve the distribution system for getting local food to local consumers and businesses.

The KYF initiative includes 27 different grant and loan programs that promote local and regional food. A number of programs aim to promote the establishment of food hubs that enable small-scale local farmers to aggregate produce, and share distribution and marketing facilities, in order to sell to local businesses and institutions.³¹⁴

The Farm to School program encourages take up of local foods into school lunch services and aims to connect schools with local farmers. In 2013-14, schools bought almost US\$ 790 million in local food, and the USDA estimates that school spending on local food generated over US\$ 1 billion in local economic activity.³¹⁵

Other programs in the KYF initiative include: Farm Microloans that provides loans to new farmers to start farming and market their produce direct to consumers³¹⁶; and the Community Food Projects Competitive Grants Program that supports projects that increase access to healthy, local food for people on low incomes.³¹⁷ The USDA Economic Research Service estimates that local food systems generate 13 jobs on farm for every \$1 million in sales³¹⁸, and in 2012, the value of local food sales in the United States was estimated at over \$US 6 billion.³¹⁹

313 USDA (2016) Know Your Farmer, Know Your Food compass. Washington DC: United States Department of Agriculture.

314 Matson, J., Sullins, M. and Cook, C. (2013) The role of food hubs in local food marketing. USDA Rural Development Service Report 73. Washington DC: United States Department of Agriculture.

315 USDA (2016a) The farm to school census 2015. Washington DC: United States Department of Agriculture.

316 USDA Farm Service Agency (2015) Microloan program. Available <http://www.fsa.usda.gov/programs-and-services/farm-loan-programs/microloans/index> [accessed 10 November 2016].

317 USDA (2016b) Community food projects competitive grants program. Available <https://nifa.usda.gov/funding-opportunity/community-food-projects-cfp-competitive-grants-program> [accessed 10 November 2016].

318 USDA (2016) As above.

319 Low, S., Adalja, A., Beaulieu, E., Key, N., Martinez, S., Melton, A., Perez, A., Ralston, K., Stewart, H., Suttles, S. and Vogel, S. (2015) Trends in US local and regional food systems. A report to Congress. Washington DC: USDA Economic Research Service.

Areas of fertile farmland close to water treatment plants are arguably some of the most strategically significant areas of farmland in Victoria.

Appropriate-scale infrastructure is critical to the ongoing viability of regional food enterprises. This includes co-marketing, warehousing, storage and distribution offered by food hubs; community spaces that facilitate collection, cooking, eating, and celebration of food; and abattoirs and other food-processing facilities that will handle small-scale processing, diverse species, and separation of organic and conventional produce.

The type of regulation that is appropriate for small-scale food distribution and processing is highly contested, as the costs of compliance can be disproportionately large for small producers and processors. In response to this, 'Cottage Food' Laws have been developed in some regions to reduce the compliance requirements for some small, direct and intermediated produce e.g. see California's Cottage Food Laws.³²⁰ In Australia, the Australian Food Sovereignty Alliance has advocated on these issues.³²¹ The recent Victorian Inquiry into intensive animal industries (and the government response) has recognised the need for differentiated planning requirements, so that smaller operations are not over-regulated.³²²

The role of educational institutions has been important to the acceleration of the regional food economy in North America and Europe, particularly in raising the capacity of the local workforce to meet the labour demands of emerging food economy businesses.³²³ In Melbourne, higher education offerings are beginning to emerge to address the opportunities of the regional food economy, particularly the Master of Environment at the University of Melbourne, and the Bachelor and Master degrees in Food Studies soon commencing at the William Angliss Institute. Research has also been critical to the development of new technologies and processes.³²⁴

320 California Department of Public Health (2013), Cottage Food Operations - Overview, <http://www.cdph.ca.gov/programs/Documents/fdbCFOover.pdf> and <http://www.cdph.ca.gov/programs/pages/fdbcottagefood.aspx>

321 See <http://www.australianfoodsovereigntyalliance.org/home-page/>

322 Victorian Government (2016) Planning for sustainable animal industries: Victorian Government's response to the Animal Industries Advisory Committee's Final report, October 2016

323 Rose, N. and Larsen, K. (2013) As above.

324 Rose, N. and Larsen, K. (2013) As above.

Reuse water to grow food in a drying climate

Policy objective

Reuse water to grow food in a drying climate

Deliver more treated waste water to city fringe farmers to increase the capacity for fresh food production during drought

Potential policy approaches to achieve the objective

- Invest in infrastructure to increase the delivery of recycled water to farmers
- Set a target in state water policy for delivery of recycled water for agriculture
- Establish 'drought proof' areas of food production in proximity to key water treatment plants
- Explore options for potential use of stormwater in city fringe farming

Water availability is a significant constraint on agriculture in Victoria, and climate change is likely to further reduce the availability of water for food production.³²⁵ The social and economic impacts of water scarcity were felt during the Millennium Drought, when agricultural output fell, the price of fresh foods rose and around 35,000 jobs were lost in the food and agriculture sectors in Victoria (see sections 3.1 and 5.3).

Melbourne's foodbowl has the potential to increase the resilience of the city's food system to the chronic stress of water scarcity, because of its access to waste water from the city's water treatment plants. Recycled waste water is likely to be one of the most secure sources of water for food production in a warming climate, and areas of fertile farmland close to water treatment plants are arguably some of the most strategically significant areas of farmland in Victoria because of their potential to be developed as future 'drought proof' areas of food production.³²⁶

Areas of food production close to Melbourne's two main water treatment plants – such as Werribee, near the Western Treatment Plant, and Casey, near the Eastern Treatment Plant – are currently among the areas most at risk from future urban development, because of their proximity to the urban growth boundary and the city's growth corridors. Areas of food production close to the city's water treatment plants should be protected and considered for development as future 'drought proof' foodbowls.

Schemes to reuse water for food production already operate from Melbourne's main water treatment plants but only a small proportion of the available recycled water is currently used (see section 5.3). There is an opportunity to expand the use of recycled water for food production in Melbourne's foodbowl by investing in infrastructure to deliver recycled water

325 DELWP (2016) Managing extreme water shortage in Victoria: Lessons from the millennium drought. Melbourne: Department of Environment, Land, Water and Planning.

326 Carey, R. (2016) Submission to the Water for Victoria discussion paper. Submission from the Foodprint Melbourne project, Victorian Eco-Innovation Lab, the University of Melbourne. 13 May 2016.

Increasing the use of recycled water for food production has a broad range of public benefits.

to more farmers. This is likely to require investment in additional storage capacity to store recycled water produced outside of the main growing season, new pipelines to deliver water to farmers, and initiatives to improve water quality.

Long term planning is required to forecast demand for recycled water across a broad range of plausible climate scenarios. Effective planning would draw on climate modelling and consider the impact of water scarcity on food security and food prices, in addition to its broader economic impact (see section 5.3). One potential barrier to expanding the use of recycled water for food production is the high cost of the water for farmers. The Essential Services Commission pricing principles for recycled water require the full cost of providing recycled water to be recovered from farmers.³²⁷ However, increasing the use of recycled water for fresh food production has a broad range of public benefits, including mitigation of rising food prices during drought, reduced demand on other sources of fresh water and improved ecosystem services, such as increased environmental flows in river systems.

Consideration of the broad range of public benefits from the use of recycled water in food production suggests a case for greater government investment in recycled water schemes. One potential approach is to include targets for treatment and delivery of recycled water in the Statement of Obligations for the state's water corporations, which would enable the costs of providing recycled water to farmers to be shared with other water customers.³²⁸ Similar targets were in place when investments were made in existing infrastructure to deliver recycled water to the Werribee Irrigation District, which proved critical during the Millennium Drought (see the case study). Analysis of policy underpinning recycled water development in Australia by the Australian Water Recycling Centre of Excellence found that state-based water recycling targets are a key factor that provide the security needed for investment in development of recycled water infrastructure.³²⁹ If the state's water corporations were required to report on the availability of recycled water for agriculture, this would also enable more accurate assessments to be made in future of the potential of recycled water for food production.

327 Melbourne Water (2013) Melbourne Water 2013 water plan. Melbourne: Melbourne Water.

328 Melbourne Water (2013) As above.

329 Institute for Sustainable Futures (2013) Policy Settings, Regulatory Frameworks and Recycled Water Schemes. Sydney: Institute for Sustainable Futures.

Case Study: Werribee Irrigation Scheme

Werribee South is one of Victoria's most important vegetable growing areas, producing around 10% of the state's vegetable crops from just 0.02% of its agricultural land.³³⁰ Around 300 growers in the district produce lettuces, broccoli, cabbages and other vegetables.³³¹ Werribee Irrigation District is located around 30 kilometres west of Melbourne's CBD next to the Western Treatment Plant, which treats around two thirds of Melbourne's wastewater.³³²

Werribee Irrigation District has long been irrigated from the Werribee River, but at the height of the Millennium Drought, flows in the Werribee River were so low that extraction for irrigation was capped at 5% of entitlements in 2006/07, and 0% of entitlements in 2007/08.³³³ Farmers turned to groundwater as a replacement, but groundwater extraction was stopped with little warning due to worryingly low aquifer levels, leaving farmers without irrigation water for cropping.³³⁴

In 2004, with other sources of irrigation water under pressure, the state government committed over \$20 million to develop additional water treatment at the Western Treatment Plant and a pipeline to the irrigation district.³³⁵ A 55ML per day Class A water plant was completed within 12 months, and farmers received their first deliveries of recycled water in 2005, creating one of the largest recycled water schemes in Australia.

While the recycled water was initially intended to supplement river water and groundwater, the extreme conditions of the Millennium Drought meant that it quickly became the dominant water supply for the Werribee Irrigation District, preventing production in the area from collapsing. Salinity levels in the water are relatively high, due to high salt levels in effluent from industry and domestic sources, and recycled water is currently mixed with river water to reduce salt levels.³³⁶ However, diverting recycled water to irrigation has also reduced environmental impacts on marine environments, thanks to the reduced outflow from the plant.³³⁷

330 Sheridan, J., Larsen, K. and Carey, R. (2015) Melbourne's Foodbowl: Now and at Seven Million. Victorian Eco-Innovation Lab, The University of Melbourne.

331 Southern Rural Water (2016) Recycled water (Werribee). Available: <http://www.srw.com.au/water-systems/recycled-water-werribee/> (accessed 14 November 2016)

332 Melbourne Water (2015) Enhancing Life and Liveability. Melbourne Water

333 Rodda, C. and Kent, M. (2008) Werribee Irrigation District Recycling Scheme: the First Years. Irrigation Australia Conference and Exhibition, Melbourne, Australia, 20–22 May 2008.

334 Rodda (2008) As above

335 Southern Rural Water (2016) As above.

336 Southern Rural Water (2016) As above.

337 Rodda (2008) As above

Investment in recycled water infrastructure for food production can be used not only to safeguard agricultural production from the impacts of water scarcity, but also to expand food production in areas of fertile soils that have unreliable water supply. This occurred for the development of high value viticulture and horticulture crops in the Bellarine Peninsula and in Adelaide's foodbowl³³⁸, and is being investigated as a mechanism for expanding areas of horticultural production in Melbourne's southeast.³³⁹

The potential to harness stormwater as an alternative source of water for food production in Melbourne's foodbowl is currently less clear than the proven potential of recycled water. However, investigations of its potential are underway by state and local governments in Victoria³⁴⁰, and the South Australian Government is also exploring the possibility of harnessing stormwater for food production on the fringe of Adelaide.³⁴¹ This is an area that warrants ongoing exploration.

338 Melbourne Water (2013) As above.

339 See <https://www.casey.vic.gov.au/business/support/bunyip-food-belt>

340 Melbourne Water (2013a) Stormwater strategy: A Melbourne Water strategy for managing rural and urban stormwater runoff. Melbourne: Melbourne Water.

341 Department for Water (2011) Stormwater strategy: The future of stormwater management. Adelaide: Department for Water.

Case study: Virginia Pipeline Scheme

The Virginia Pipeline Scheme delivers recycled water from the Bolivar Waste Water Treatment Plant (BWWTP) to around 350 horticultural growers in the Northern Adelaide Plains region, around 35 km from Adelaide.³⁴² The scheme was established in 1999, driven by local growers that were facing a shortage of irrigation water.³⁴³

The scheme delivers around 17 GL of Class A treated recycled water via a 100 kilometre-long network of pipelines.³⁴⁴ The recycled water is used to grow a wide variety of fruit and vegetables, nuts, olives and wine grapes. It has been important in providing a secure source of water for growers in the region during one of the driest periods on record.³⁴⁵

An initiative is now underway to plan the next stage of expansion for this recycled water scheme. The Northern Adelaide Irrigation Scheme is a proposal to provide an additional 20 GL of recycled water from the BWWTP to growers in the Northern Adelaide Plains region, more than doubling the current capacity of the scheme.³⁴⁶

A key component of this new proposal is investment in storage infrastructure, so that recycled water produced during the winter can be made available during the main growing season in the drier months. Two types of storage are currently being explored, below ground storage in a local aquifer and above ground storage in a series of lagoons.³⁴⁷

Increasing the capacity of the recycled water scheme has a number of potential social, environmental and economic benefits. The Northern Adelaide Plains region produces around \$350 million of agricultural products a year, which represents around a third of South Australia's Gross Domestic Product from Agriculture³⁴⁸, and water availability is currently a key constraint on horticultural production. Increasing the use of recycled water from the BWWTP also reduces discharge to the Gulf of St Vincent, protecting the state's marine environment.³⁴⁹

342 SA Water (2015) SA water guidelines for recycled water storage in the Northern Adelaide Plains. Adelaide: SA Water.

343 Seshadri, B., Bolan, N., Kunhikrishnan, A., Chowdhury, S., Thangarajan, R. and Chuasavathi, T. (2015) Recycled water irrigation in Australia. In Thangavel, P. and Sridevi, G. (eds) Environmental Sustainability. India: Springer.

344 SA Water (2015) As above.

345 Sheshadri et al. (2015) As above.

346 SA Water (2016) Northern Adelaide Irrigation Scheme. News Sheet No. 1 – March 2016. Adelaide: SA Water.

347 SA Water (2015) As above.

348 PIRSA (2015), quoted in SA Water (2015) As above.

349 SA Water (2015) As above.

Reduce and reuse food waste and organic waste

Reduce and reuse food waste and organic waste

Harness city food waste and organic waste to generate an alternative supply of organic fertilisers as supplies of traditional fertilisers (fossil fuels and phosphate) decline

- Invest in infrastructure to process city food waste and organic waste into animal feed and fertilisers for use on farm
- Establish a grant scheme for innovative new enterprises that use second grade produce from Melbourne's foodbowl
- Establish a food waste network that brings stakeholders from across Melbourne's food system together to tackle food waste

A significant amount of food is wasted through the food supply chain in feeding Melbourne, undermining the resilience of the city's food system (see section 5.4). Most policy initiatives to reduce food waste have focused to date on reducing household food waste through programs that aim to raise awareness and educate consumers. Examples include the Victorian state government Love Food Hate Waste Program³⁵⁰ and local government initiatives in Greater Melbourne, such as the Food Know How program.³⁵¹

These initiatives are important to reduce household food waste. However, around 60% of the waste incurred in feeding Melbourne occurs at earlier stages of the food supply chain, before food reaches households.³⁵² Retailers have established fresh food recovery programs across Australia that aim to ensure that edible food that can't be sold in store is distributed to people experiencing food insecurity, via organisations such as Secondbite, FareShare, and Oz Harvest. However, other opportunities exist to address food waste through the supply chain.

City region food systems provide opportunities to tackle food waste by harnessing city food waste to produce fertilisers and animal feed that can be used on farm, and by finding new local markets for 'B grade' (second grade) produce that is wasted on farm because it doesn't meet the product specification standards of the major retailers (see section 5.4).

In California, large scale projects to convert organic and food waste to fertilisers have begun to emerge, after the state government passed legislation in 2014 mandating that businesses that generate food waste must have the waste composted or converted to energy via anaerobic digestion.³⁵³ California Safe Soil is an example of one of these initiatives (see the case study). Cities across Sri Lanka have also introduced composting plants that recycle organic waste for use on city fringe farms. Government funding has been made available to establish the composting plants, which are typically located in semi-rural areas just outside the cities and close to farms.³⁵⁴

350 For more information, see <http://www.lovefoodhatewaste.vic.gov.au>

351 For example, the Food Know How project - <http://www.foodknowhow.org.au>

352 Sheridan, J., Carey, R. and Candy, S. (2016) As above.

353 California Assembly bill no. 1826, chapter 727. Solid waste: organic waste (2013-14). See http://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB1826

354 Gianfelici, F., Lancon, L., Bucatariu, C., Dubbeling, M., Santini, G. and Sudarshana, F. (2016) Composting urban organic waste into agricultural inputs. In Dubbeling, M., Bucatariu, C., Santini, G., Vogt, C. and Eisenbeiss, K. (eds) City region food system and food waste management: linking urban and rural areas for sustainable development. Bonn: German Federal Ministry for Economic Cooperation and Development.

Case study: California Safe Soil

In California, unsold fresh food that supermarkets can't donate to food redistribution organisations is being collected and recycled into liquid fertiliser for agriculture. Since 2012, California Safe Soil has been using mechanical grinding, heating, and enzymatic digestion (which is 720 times more efficient than composting) to produce a liquid fertiliser product.³⁵⁵

The new technology means that it only takes three hours to turn waste into new products for agricultural use. Little gets lost in the process, with close to 90% turned into liquid fertiliser and 10% into animal feed. As the waste processing is contained, they also avoid some of the common composting facility complaints around smell, and the speed of turnaround means far less land is needed for the facility than some other composting techniques.

Creating a liquid final product reduces the bulk of freight compared to compost, and has allowed farmers to deliver the fertiliser through existing irrigation networks. Application of the liquid fertiliser has seen growth rates boosted by up to 30%, and water application reduced by up to 25%.³⁵⁶ This has reduced reliance on some synthetic fertilisers, and helped lower the level of nitrate run-off.

After four years the company is expanding, which will enable them to process enough waste to produce liquid fertiliser for 128,000 acres of agriculture and also 3,200 tonnes of animal feed. This will reduce GHG emission by 74,000 MTCO₂e – equivalent to taking 15,000 cars off the road.³⁵⁷ The company's next steps are expanding its collection service, and beginning to finesse their fertiliser compositions to match particular crop needs.³⁵⁸

355 For more information visit the California Safe Soil website: <http://www.calsafesoil.com>

356 <https://agfundernews.com/california-safe-soil-gives-new-life-food-waste.html>

357 <http://www.calsafesoil.com/blog/california-safe-soil-from-pilot-plant-to-a-commercial-facility>

358 <https://agfundernews.com/california-safe-soil-gives-new-life-food-waste.html>

Small-scale trials are also underway in Melbourne to convert food waste to outputs that could be used on farm, such as the City of Melbourne's dehydrator unit at Ross House in Degraeves Street, which can process up to 1,200 kg of food waste from local food outlets each day.³⁵⁹ One of the barriers to large-scale conversion of organic waste to compost in Melbourne is a lack of appropriate infrastructure to collect and process the waste. The Metropolitan Waste and Resource Recovery Group has identified a need to significantly increase capacity for kerbside food and garden waste collections in Melbourne and to establish facilities with the capacity to process this waste. It expects that processing of organic waste will be achieved through a mix of closed, advanced systems in the metropolitan area and open composting systems in regional Victoria.³⁶⁰ Infrastructure Victoria's draft 30-year infrastructure strategy also recognises a need to "accelerate actions identified in the Victorian organics resource recovery strategy to increase recovery of organic waste sent to landfill and address the low rates of recovery".³⁶¹

While much household food waste is inappropriate for use as animal feed, there is potential to encourage the use of edible by-products from food processing as an alternative animal feed. Campaigns are also emerging in other countries to increase the proportion of wasted food that is fed to animals, such as The Pig Idea in the UK.³⁶²

Innovative schemes are emerging to reduce on farm food waste, while delivering other benefits, such as increasing access to healthy food for people experiencing food insecurity. The city of Curitiba in Brazil has established a scheme to support local farmers, reduce on farm food waste and address high rates of food insecurity in the city. The city buys produce from local farmers at a set price. This produce is then taken to recycling centres, where citizens are able to trade their recyclable materials in exchange for fresh produce. Citizens can trade 4 kg of recyclables for 1 kg of fresh produce. Around 70% of low income households living in the city's slums participate in the program, which has led to 22% recovery of recyclable materials and in 2014, 97 tonnes of food was distributed to 7.2 million people.³⁶³

In Victoria, Spade and Barrow aimed to reduce on farm food waste by buying 'the whole crop' from farmers, including produce that would typically fail to meet the product specification standards of the major supermarkets.³⁶⁴ Other enterprises are also exploring new ways of working across the food supply chain to reduce waste.³⁶⁵ There is an opportunity to support the establishment of enterprises that work in innovative ways with

359 Metropolitan Waste and Resource Recovery Group (2016) Metropolitan waste and resource recovery implementation plan. Melbourne: Metropolitan Waste and Resource Recovery Group

360 Metropolitan Waste and Resource Recovery Group (2016) As above.

361 Infrastructure Victoria (2016) Victoria's draft 30-year infrastructure strategy. October 2016. Melbourne: Infrastructure Victoria.

362 For more information, see <http://thepigidea.org>

363 Gianfelici, F., Lancon, L., Bucatariu, C., Dubbeling, M., Santini, G., Munaretto, M., and Teixeira, L. (2016) Reducing and recycling of urban waste in support of adequate urban diets and prevention of on-farm food waste. In In Dubbeling, M., Bucatariu, C., Santini, G., Vogt, C. and Eisenbeiss, K. (eds) As above.

364 See <http://www.spadeandbarrow.com.au/home.php>

365 For example, Yume – <http://theyumeapp.com>

partners across the food system to reduce food waste – and in doing so – meet multiple objectives of reducing environmental impacts, strengthening economic viability for farmers and increasing access to healthy foods.

One of the best ways for Melbourne to encourage innovation in tackling food waste would be to establish a food waste network that would bring together key stakeholders from across the food system to work on strategies and initiatives to reduce food waste. The Ontario Food Collaborative is an example of such a network (see the case study). Similar cross-sector initiatives are emerging around the world at local, regional and national level, as stakeholders come together across the food supply chain to find constructive solutions to reducing food waste.³⁶⁶

Case study: Ontario Food Collaborative

The Ontario Food Collaborative (OFC) is a Canadian cross-municipal collaboration that uses a whole food systems approach to reduce food waste³⁶⁷, recognising that much food waste occurs early in the food supply chain, on farm or during processing, rather than in households.

Participants in the OFC include actors across all levels of government, non-government organisations, farmers, food processors, distributors and retailers, restaurants and food services. The initiative began in 2014 with a roundtable to share information and develop a shared vision for food waste reduction, which has led to the development of an overarching strategy to tackle the issue.³⁶⁸

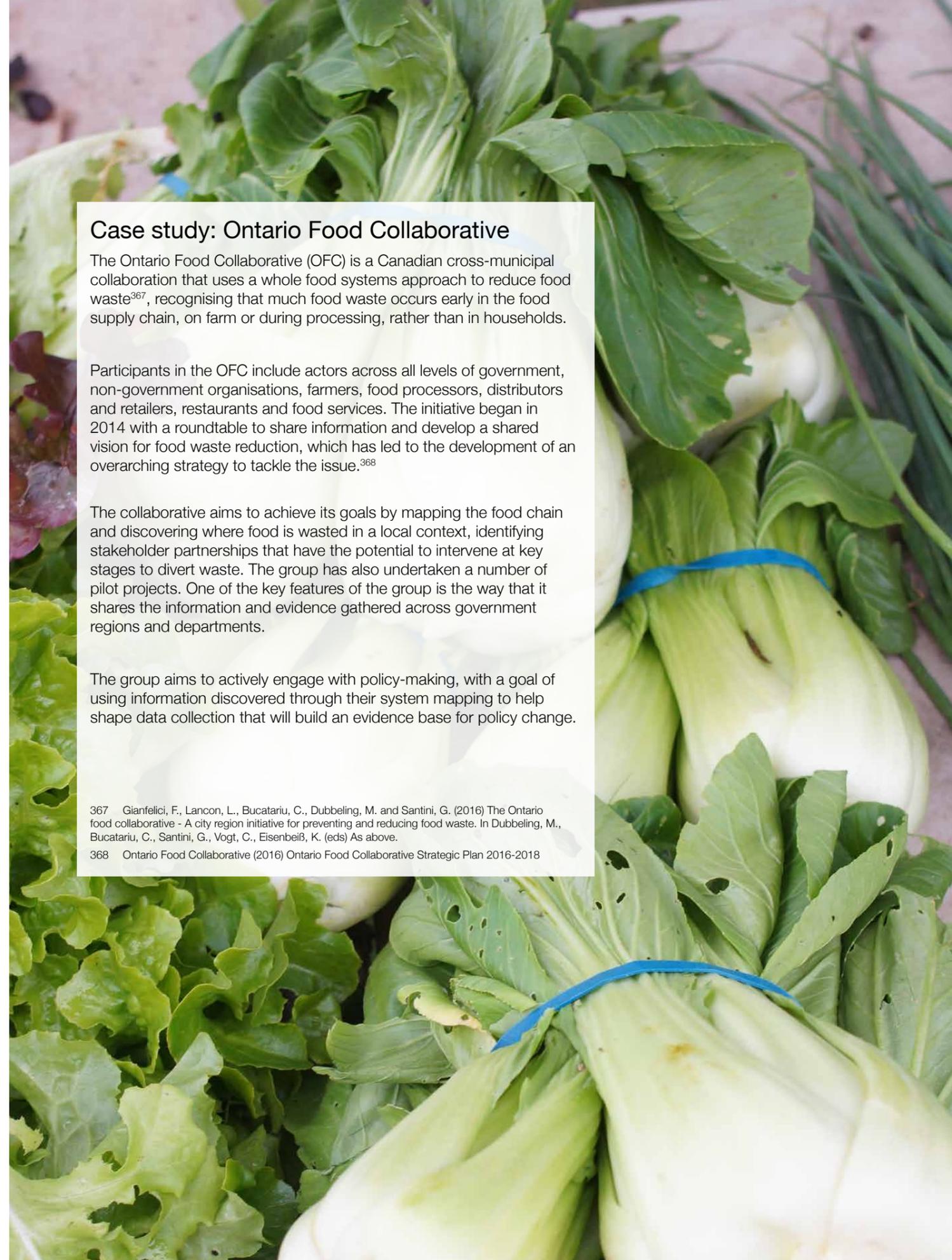
The collaborative aims to achieve its goals by mapping the food chain and discovering where food is wasted in a local context, identifying stakeholder partnerships that have the potential to intervene at key stages to divert waste. The group has also undertaken a number of pilot projects. One of the key features of the group is the way that it shares the information and evidence gathered across government regions and departments.

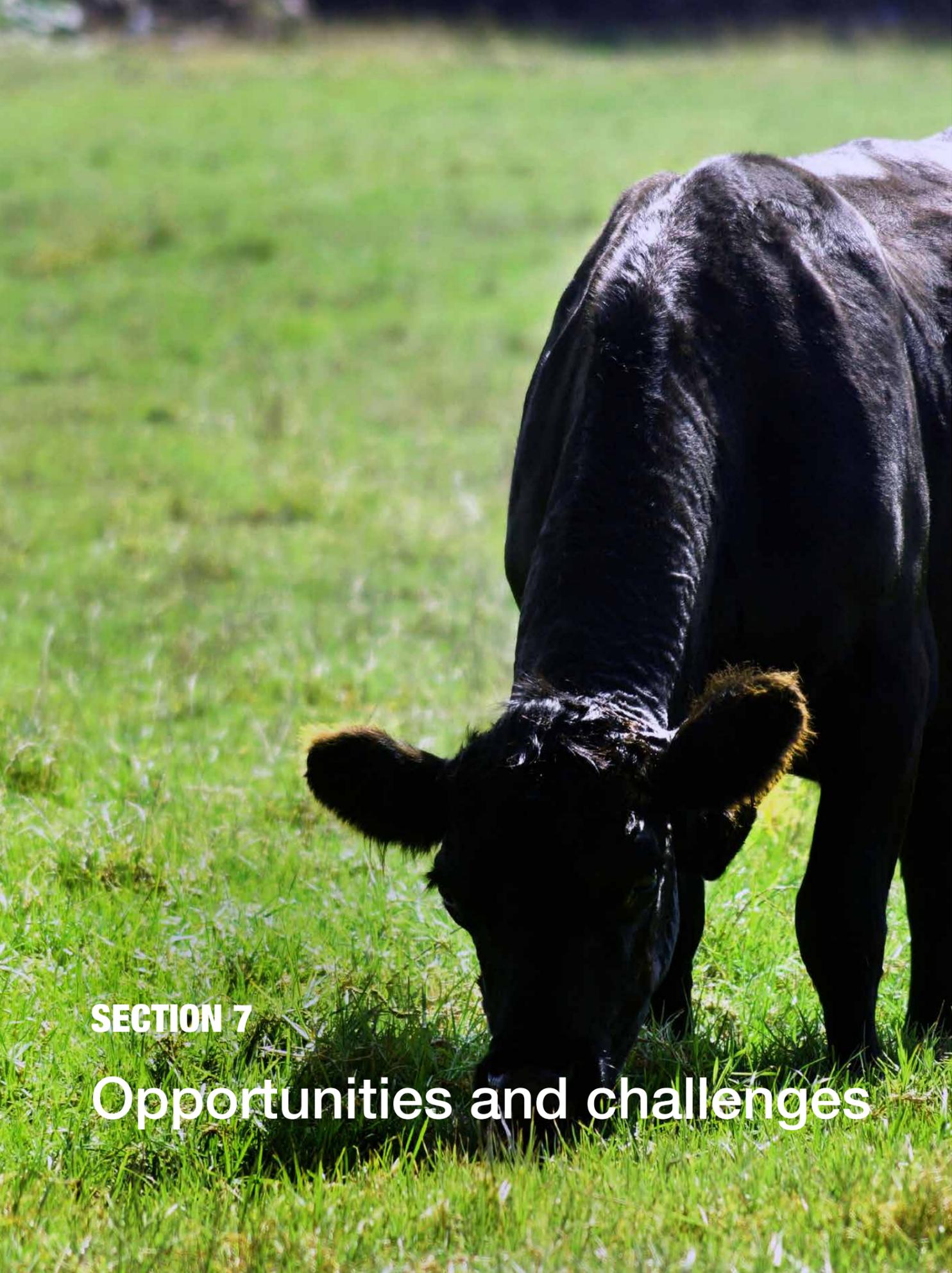
The group aims to actively engage with policy-making, with a goal of using information discovered through their system mapping to help shape data collection that will build an evidence base for policy change.

³⁶⁷ Gianfelici, F., Lancon, L., Bucatariu, C., Dubbeling, M. and Santini, G. (2016) The Ontario food collaborative - A city region initiative for preventing and reducing food waste. In Dubbeling, M., Bucatariu, C., Santini, G., Vogt, C., Eisenbeiß, K. (eds) As above.

³⁶⁸ Ontario Food Collaborative (2016) Ontario Food Collaborative Strategic Plan 2016-2018

³⁶⁶ For example, the UK Food Waste Coalition. See Evans, D. and Welch, D. (2015) Food waste transitions. Manchester: The Sustainable Consumption Institute.





SECTION 7

Opportunities and challenges

The Foodprint Melbourne project has trialled new methodologies for analysis of city foodbowls in Australia.³⁶⁹ This includes new approaches to exploring:

- the productive capacity of a city foodbowl and the impact of loss of farmland on the foodbowl's capacity to feed the city
- the natural resource requirements and environmental impacts of feeding a city
- the contribution of the foodbowl to the regional economy, the potential impact of loss of farmland on the foodbowl's economic contribution, and the potential to grow the regional food economy

The project has used scenario modelling to enable exploration of various possible futures and to investigate the interaction between potential planning and infrastructure decisions and the sustainability and resilience of Melbourne's food supply. Scenario modelling enables 'what if' questions to be asked about current directions or potential future actions, so that the interactions between different elements in a complex system can be explored (e.g. the interactions between loss of farmland and the productive capacity of the city's foodbowl). In quantitative scenario modelling, plausible sets of circumstances are defined to enable these explorations, but the scenarios are neither predictive nor normative. Instead, they provide a 'guide' about the possible directions in which we are heading.

Food systems analysis is an emerging field, and there are data gaps and limitations to the methodologies that are currently available. Some of the limitations are outlined below, along with recommendations for further research. For further discussion of the research limitations and data gaps identified in previous stages of the Foodprint Melbourne project, see the reports on Melbourne's Foodbowl³⁷⁰ and Melbourne's Foodprint.³⁷¹

7.1 Research challenges

Data availability and quality

The 'building blocks' of food systems analysis include data about food production (what food is produced, how, where and when) and the resources required for food production (land, water, energy and people). There are three major limitations to these data sets in Australia:

- Data sets available for different purposes cover geographical areas with different 'shapes'. This makes it difficult to compare different types of data, and some 'adjustment' is required to enable comparison in the context of a city foodbowl

³⁶⁹ Similar research has been taking place in Sydney. See Wynne, L., Cordell, D., Chong, J. and Jacobs, B. (2016) Planning tools for strategic management of peri-urban food production. Sydney: RICS Research Trust.

³⁷⁰ Sheridan, J., Larsen, K. and Carey, R. (2015) Melbourne's foodbowl: now and at 7 million. Victorian Eco-Innovation Lab, The University of Melbourne.

³⁷¹ Sheridan, J., Carey, R. and Candy, S. (2016) Melbourne's foodprint: what does it take to feed a city? Victorian Eco-Innovation Lab, The University of Melbourne.

- Some types of data have known inaccuracies. For example, there is evidence that ABS Agricultural Commodities data may underestimate production, particularly in peri-urban areas, which often have multiple crops under constant harvest³⁷²
- Data releases can be infrequent. For example, detailed ABS Agricultural Commodities data (about the type and amount of crops produced in Australia, down to a suburb level) is released every 5 years. This project relied on data from 2010-11.

Some areas of food systems analysis are not currently well understood in Australia, such as the conversion of organic and food waste to fertilisers and nutrients, the movements of food freight between and within states, and the benefits of (and resources required to produce) recycled water. These are described further in the section on 'opportunities for further research'.

Adapting a national model to analysis of a city region food system

The Foodprint Melbourne project draws on data from a study of Australia's national food security³⁷³, which was based on the CSIRO-developed Australian Stocks and Flows Framework (ASFF). One of the aims of this project was to evaluate the use of the ASFF framework for modelling challenges to food supply at city region scale.

ASFF is a framework for evaluating environmental sustainability challenges in Australia and for modelling potential solutions.³⁷⁴ It was designed to explore these issues at a national scale, and over the long term. Care is required in adapting the model for use at a smaller geographic scale, or for exploring issues over the short to medium term. For example, as ASFF is designed to model trends over the long term, the effects of recent changes in trends (such as a recent slowing or acceleration of a trend) can be masked. ASFF also has considerable spatial detail. However, different types of data are modeled over different spatial regions. For example, agriculture is modeled over 58 statistical divisions across Australia, while water resources are modelled over 74 water regions and population across 217 sub-statistical divisions. At a national scale, these differences have little or no impact on the results of modelling. However, at a city region scale, considerable additional work is required to validate the results of the modelling.

ASFF is a complex physical model, built for a high level of user input i.e. for a large team of researchers who can check and adjust input data across a wide range of areas. Considerable resources are required to ensure that key information pertaining to food systems is accurate and up-to-date. There are a number of areas where inputs required manipulation or where

372 Parberry, P., Wilkinson, R. and Karunaratne, K. (2008) Square pegs in green wedges: landholders and natural resource management in Melbourne's rural hinterland. Melbourne: Department of Primary Industries

373 The project draws on data from a project funded by the Australian Research Council - 'Modelling policy interventions to protect Australia's food security in the face of environmental sustainability challenges' (LP120100168), a collaborative project between the Victorian Eco-Innovation Lab (at the University of Melbourne), Deakin University and the Australian National University.

374 Sheridan, J., Carey, R. and Candy, S. (2016) As above.

assumptions needed to be made in order to interface with ASFF. In other areas, data in the model was inappropriate for analysis at the city-region scale and required adjustments e.g. grazing areas for livestock are larger on average across Australia than they are in Melbourne's foodbowl. At times, workarounds were developed outside ASFF to address data gaps or constraints related to the capacity of the framework. The resources required to use ASFF to its potential could make it difficult for small teams to use at a regional level.

Modelling local and regional food economies

One of the aims of this project was to understand the economic contribution of Melbourne's foodbowl and the potential to grow Melbourne's local and regional food economy (see section 4.4). Modelling the potential of local and regional food economies is challenging, as this is an emerging area of research. Relatively few analyses of this type have been undertaken, and none (to our knowledge) in an Australian context.

A wide variety of approaches are currently used to model local and regional food economies, and there is no common agreement on a standard set of assumptions that should underpin economic modelling in this context.³⁷⁵ Studies typically attempt to estimate the secondary impacts of local and regional food systems (throughout the economy), but there is no consensus among researchers about how to measure these impacts³⁷⁶, and researchers have also yet to agree on a standard way of accounting for the opportunity costs.³⁷⁷ The behaviours and financial flows of emerging distribution models central to local regional food economies (such as food hubs, farmers markets, community supported agriculture etc.) are currently poorly understood and therefore not well represented in existing economic models. For example, in a local and regional food economy, more of the agricultural value-add (processing, distribution and retail) may remain in the regional economy than is typical in 'mainstream' industry sectors.³⁷⁸ These methodological challenges applied to the analysis undertaken by Deloitte Access Economics in relation to the potential to grow Melbourne's regional food economy through increasing demand for locally produced food.

Effective modelling of the potential of local and regional food economies also requires new types of data, such as an understanding of how much of the food produced in a local area is currently consumed locally. The movement of food freight in Australia is not well tracked within or between states (although good sources of data exist about food exports). The best sources of data are proprietary (held by retailers, wholesale markets etc.) and not publicly available. This research drew on the best available sources of data, including unpublished reports and personal communication with

375 Low, S., Adalja, A., Beaulieu, E., Key, N., Martinez, S., Melton, A., Perez, A., Ralston, K., Stewart, H., Suttles, S., Vogel, S. and Jablonski, B. (2015) Trends in US local and regional food systems. Washington: US Department of Agriculture, Economic Research Service.

376 Miller, S., Mann, J., Barry, J., Kalchick, T., Pirog, R., and Hamm, M. (2014) Valuing Michigan's local food system: a replicable model for valuing local food. Michigan: Michigan State University.

377 Low et al. (2015) As above.

378 Schmit, T., Jablonski, B. and Kay, D. (2013) Assessing the economic impacts of regional food hubs. Presentation to Innovative Strategies in Local Foods Marketing Symposium, USDA - Agricultural Marketing Service Washington, D.C. August 7, 2013 (revised 10 Oct 2013)

industry sources, in order to generate a set of assumptions.³⁷⁹ However, further research is needed to better understand the role of regionally-produced food in Australia's food supply.

7.2 Opportunities for further research

There are many areas of the food system in Melbourne (and indeed nationally) where data is either not publicly available or at best indicative. Further research would be useful to develop additional data to support food systems analysis. Gaps in knowledge include:

- Movements of food through the food supply chain from production to consumption, including interstate and intrastate food freight movements through distribution operations and retail channels (see above)
- Food processing – there is little publicly available data about the quantities of produce that are transformed from raw commodities into processed foodstuffs, how this happens and the resources required
- Food waste – while there is sound evidence about the extent of household food waste in Victoria, there is little publicly available data in Australia about food waste during earlier stages of the food supply chain (pre-farmgate, food processing and retail) or food waste in restaurants and cafes
- Transformation of organic waste to fertiliser, including the volumes of waste available, nutrient profiles and availability (to plants) from organic waste products (e.g. compost), infrastructure and distribution requirements available to convert organic and food waste to fertilisers, and the value of urban proximity in making these nutrients available
- The availability and quality of recycled water for agriculture - the existing and potential supply of water from water treatment plants, the (storage and pipe) infrastructure that is required to deliver recycled water to more farmers, the dependence of recycled water availability on other factors (such as residential water use and seasonal fluctuations), and the demand for recycled water in a range of plausible, long term climate scenarios
- The potential of stormwater diversion as an alternative source of water for food production
- The extent of community based food production, including home production, and its potential contribution to a more resilient food supply

Further research is also required to understand the human, economic and financial drivers that exacerbate risks and create opportunities in Melbourne's foodbowl, as well affecting its overall sustainability and resilience. There is a need for greater understanding of:

- Challenges to farm viability in Melbourne's foodbowl, including the impact of high land prices and rates, and potential financing options

- Potential impacts (physical, human and economic) of increasing the diversity and sustainability of production methods in Melbourne's foodbowl, including regenerative agriculture, mixed polyculture, edible forestry etc.
- The likely impacts of climate change on Melbourne's foodbowl, including the impacts of acute shocks (e.g. storms, floods and fires) and chronic stresses (e.g. shifting biozones, sea-level rise and salt water inundation, temperature changes affecting crop growth etc.)
- The resilience of the food supply chains that underpin Melbourne's food system to acute shocks, such as climate-related shocks (e.g. storms and floods) or disruption in fuel supplies
- What a sustainable diet might look like in an Australian context, the potential costs and benefits (environmental, health and economic) of shifting to a more sustainable diet, and the most effective approaches for shifting consumer behaviour
- The causes of food waste through the food supply chain – including the routines and practices in homes that lead to household waste – and the most effective strategies to shift the behaviour of stakeholders throughout the food system in order to reduce food waste (including strategies to shift consumer behaviour and the potential role of retailers in influencing household food waste)
- Opportunities to grow the regional food economy through strengthening regional distribution chains, including exploration of the value of new types of short food supply chains
- Approaches to assess the value of city fringe farmland and agriculture in terms of its multiple public benefits (social and environmental, as well as economic), including its contribution to increasing the resilience and sustainability of the city's food supply
- Approaches to assess the economic value of the natural resources that underpin food production (water and nutrients, as well as land) both now and under different potential future scenarios e.g. what is the value of replacing conventional nitrogen and phosphorus reliance with locally produced organic waste products?

This report has provided an overview of the range of policy responses that could be considered to protect Melbourne's foodbowl and to strengthen its resilience. It is beyond the scope of this project to assess the appropriateness or effectiveness of specific policy approaches in the Melbourne and Australian context. We recommend this as a priority for further research. The most effective approaches are likely to emerge through strong partnerships between independent researchers, affected communities and a broad range of government and non-governments stakeholders across the food system.

379 For the full set of assumptions, see the report by Deloitte Access Economics.



SECTION 8

Conclusion

Melbourne sits at the centre of a highly productive foodbowl. This foodbowl makes a valuable contribution to the city's food supply, to the health of its population, and to its regional economy. The quality of the fresh produce that surrounds the city contributes to its liveability for residents and to its attractiveness as a food tourism destination for visitors.

Melbourne's food system faces new challenges from rapid population growth and climate change. The city's demand for food is likely to increase by at least 60% by 2050 to feed a predicted population of 7-8 million people, but there will be less land available to grow food. Climate change is predicted to lead to more frequent and severe droughts, floods and storms, with increasing disruption to food supplies. Availability of the natural resources that underpin food production – land, water, and fossil fuels – is also likely to become more limited in future. This combination of pressures could lead to rising food prices, with impacts on the city's food security.

Melbourne's foodbowl is an important building block in a more resilient and sustainable food future for the city. If Melbourne can grow in a way that retains – or, indeed, strengthens – the productive capacity of its foodbowl, the foodbowl could reduce the city's dependence on distant sources of food. It could act as a 'buffer' against the impact of disruptions to global and national food supplies and enable the city to harness valuable waste streams to counter declining supplies of water and conventional fertilisers. It would also continue to make an important contribution to Melbourne's regional economy and employment opportunities.

This report has presented a vision of a more resilient city foodbowl that can contribute to a healthy, sustainable and equitable food system for Melbourne. It has identified some core elements of an integrated policy framework to plan a resilient city foodbowl, and it has explored a range of possible policy approaches.

If fresh, local food is to be a part of Melbourne's food future, the city will need to plan for food. The findings of this research argue for a precautionary approach to retaining the capacity of Melbourne's foodbowl, so that the city has the flexibility to adapt to emerging pressures on its food system in the face of increasing uncertainty, and so that future generations can continue to meet some of their food needs from the abundant foodbowl that currently surrounds the city.





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November 2016