

# Urban food security, urban resilience and climate change

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# URBAN FOOD SECURITY, URBAN RESILIENCE AND CLIMATE CHANGE

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## ABSTRACT

Food security is increasingly recognised as a problem in developed countries like Australia as well as in developing countries of the global south, and as a problem facing cities and urban populations in these countries. Despite producing more food than is consumed in Australia, certain groups in particular, places are finding it increasingly difficult to access nutritious and healthy food at affordable prices. Moreover, whole urban populations have found their food supply lines severely compromised by major disasters such as floods and cyclones which are expected to have greater impacts as the climate changes.

This changing landscape of food production, distribution and consumption has drawn attention to the nature of contemporary urban food systems in general and to the security and resilience of urban food systems in particular. This has in turn highlighted the extent of urban agriculture and its potential to play a greater role in strengthening the food security of Australian cities and building urban resilience in a changing climate.

This report presents the results of a synthesis and integrative research project that explored these issues through a critical review of relevant literature and case study research in two cities. It had three main aims:

1. to increase our knowledge of the current extent of urban agriculture in Australian cities;
2. to review its capacity to play a more prominent role in enhancing urban food security and urban resilience and;
3. to assess the impacts of climate change on the capacity of urban agriculture to enhance food security and urban resilience.

The research provides much needed up-to-date information on the extent of current urban agricultural practices, a critical review of good practice in Australia and beyond and an analysis of the opportunities and barriers to the expansion of these practices, especially in the face of climate change.

# EXECUTIVE SUMMARY

## Introduction

Food security is increasingly recognised as a problem facing urban populations in developed countries like Australia as well as in the developing countries of the global south. Recent disasters, especially floods, have highlighted the fragility of food supply lines in Australian cities.

*Urban food security, urban resilience and climate change* is an NCCARF-funded project that explored urban agricultural practices through a critical review of relevant literature and case study research in two major Australian cities. It found that urban agriculture has the potential to play a greater role in strengthening the food security of Australian cities and building urban resilience in a changing climate.

## Challenges to food security

Anticipated climate change is likely to lead to more extreme weather events which are the main source of these major disruptions to urban food supplies. Viability and productivity of existing food production systems is also likely to be seriously compromised by local manifestations of climate change. Other challenges are:

- global economic change affecting the profitability and viability of many Australian exports
- rising fuel prices affecting food transportation costs
- valuable agricultural land lost to urban development
- younger people not entering or remaining in farming (in all its forms) at the same rate as previous generations
- duopoly of major food retailers is driving down the price of many foodstuffs to the detriment of smaller farmers and producers
- entrenched poverty undermining the capacity of some Australians to access nutritious food
- in some remote settlements, access to nutritious food (especially fresh fruit and vegetables) is extremely poor and prices comparatively high.

## Objectives of the research

Led by Paul Burton from Griffith University, the project was designed to:

- extend knowledge of the current diversity of urban agricultural practices in Australian cities,
- identify the social, economic and political barriers to urban agriculture and to explore the potential for extending its practice in the future, especially one increasingly affected by climate change.

## Method

This study focuses on food security in Australian cities in the context of climate change through a critical review of good practice in Australia and beyond and an analysis of the opportunities and barriers to the expansion of these practices, especially in the face of climate change. It involved two complementary strands:

1. a review of the literature: on notions of food security and related concepts such as food sovereignty; on current patterns of urban agriculture and its contribution to the consumption profile of urban populations; the impact of climate change on these patterns of urban agriculture and on possible future patterns; and on broader conceptions of urban resilience and how urban agriculture might contribute to the strengthening of resilience in cities.
2. a series of interviews with practitioners and policy makers in two case study cities in Australia: Melbourne and the Gold Coast. These case study areas were selected to reflect different historical trajectories and patterns of urban growing. They also reflect a different set of opportunities and constraints on the potential for urban agriculture to play a more prominent role in the future.

## **Research findings**

### *Literature review*

- There is increasing concern about the vulnerability of our growing cities to a number of factors, including peak oil, global economic crises and climate change. Each of these is likely to have profound effects on the security of urban food supplies. Recent disasters, especially floods, have highlighted the fragility of food supply lines in Australian cities.
- As more of the world's population lives in cities, questions of food security and food sovereignty increasingly take on an urban dimension. While much debate is concerned with how to produce enough food for a growing urban population and how to secure lines of supply from often rural places of production to urban places of consumption, greater attention is now also being paid to the production of food within urban areas.
- Food security is typically defined in terms of access to food as well as to its affordability and availability. Related concepts are also used increasingly in policy and other debates, including food sovereignty, which promote a rights-based approach to the ownership and control of food systems.
- The production of food within urban areas is an important component of urban agriculture, along with systems of food processing, distribution and sale. The management of waste from these processes is also an important element in this broad conception of urban agriculture.
- While the nutritional impacts of backyard and small scale food production in cities may be relatively modest at present, they generate a number of other benefits, including the chance to become more aware of the provenance and quality of fresh fruit and vegetables, the opportunity to work with others in producing, processing and sharing local food and the ability to use what would otherwise be waste products that are costly to dispose of.
- There is scope, therefore, for urban agriculture to make an important contribution to urban food security. This can in turn help build urban resilience and sustainable forms of urban life. However, to maximise its contribution and impact, urban agriculture must be integrated into broader food systems and into more comprehensive programs of metropolitan planning for resilience and sustainability.

- But food policy is rarely connected with other policy fields and if it is to become more influential it must become more integrated with other elements of urban policy and planning.
- While the urban poor clearly experience all too intensely the effects of food insecurity and have limited means to overcome these effects, food insecurity affects all urban residents to some extent. While relatively wealthy urban residents may be better able than their poorer neighbours to afford to buy healthy and nutritious food they will nevertheless be similarly affected by major disruptions to urban food supplies.
- Urban agriculture has the potential, therefore, to contribute to the adaptations that most cities are engaged as they strive to be more resilient in the face of various existential threats, including climate change. As it represents a form of localised food production and consumption that requires fewer energy inputs than more spatially extensive and energy intensive forms, urban agriculture also has the potential to help mitigate the factors causing climate change.
- While there are few studies to date that have attempted to quantify the potential of urban agriculture to make cities more food secure, there are many which catalogue its social and community benefits. These include the development of stronger social connections in urban communities, increased awareness of the benefits of fresh fruit and vegetables and locally produced food in a healthy diet, greater appreciation of the sources of food and of the connections between processes of food preparation and food quality.
- Urban agriculture also has the potential to re-establish connections between food and place that were once common in Australian cities, but which have to a great extent withered over the last four decades. All of these social impacts may be as significant as the nutritional benefits of urban agriculture.
- The increasingly complex systems of regulation that operate within Australian cities, especially those relating to land use planning, health and safety and the operation of small businesses, often serve to thwart attempts to grow new forms of urban agriculture. While this may not be the intention of such regulatory regimes, they can nevertheless inhibit unnecessarily these new enterprises.
- Urban agriculture represents, therefore, an important opportunity for cities to adapt in the face of climate change. It is unlikely that the major cities of Australia will ever become completely self-sufficient in food, but through greater support for urban agriculture they can become more food secure. This in turn will contribute to the overall resilience of Australian cities and to their sustainable growth in the future.\

### *Fieldwork*

A prevailing view within government is that Australia is a food secure country in which climate change is significant mainly in relation to aggregate levels of food production and to the changing viability of some major food production areas in Australia. There is little or no concern with the resilience of food supply chains to our growing urban populations.

In 2005, VicHealth made a strategic commitment to promote food security across the state and supported a number of local councils in doing so through



its Food for All project. This helped local councils integrate food security measures into their other statutory planning responsibilities.

Elsewhere, planning for local food security is minimal and more likely to be the product of efforts by local non-governmental organisations and charities. These include community gardening groups, permaculture organisations, school gardening initiatives, local producer organisations and traditional gardening clubs.

Many of those interviewed spoke of the need to join up local, small scale initiatives to help build more sustainable city-wide food systems,

*I've realised that the next step beyond an individual's isolated food forest is to have many of these linked up. To have a sense of community where people share their produce. They all grow different produce, and share it between themselves. That evens out any sort of fluctuations in species, weather, climate conditions and everything else. It creates a more resilient production system. (Melbourne backyard gardener)*

There is also a recognised need to improve the general awareness of food among urban populations,

*There's a real need for food literacy – we need a population that can be so much better educated about where food comes from, how it's grown, food chains and so on. (Food researcher)*

## **Recommendations**

- To help improve the productivity and quality of food grown in cities, detailed local studies of soil quality, the impact of airborne pollutants, water requirements and crop yields could provide great benefit in developing more detailed downscale projections of the impacts of climate change on food growing potential, in particular cities and urban areas.
- If integrated and comprehensive plans for building urban resilience are developed in Australia in similar ways to those now being implemented in other mature cities, then the potential of urban agriculture can be further enhanced. However, if urban agriculture is seen mainly as a marginal preoccupation among a green or metropolitan middle class minority, then many of the current barriers to its expansion will remain and it will not be capable of making a more significant contribution to greater urban resilience.

## **The results of this work can make a number of valuable contributions:**

- to the development of the National Food Plan currently being prepared by the Department of Agriculture, Fisheries and Forestry, especially in relation to its concerns about climate change impacts, adaptation and mitigation;
- to national debate about urban food security and urban resilience; and
- to local debates about the development of more effective policy frameworks to support urban agriculture.

# 1. INTRODUCTION

Food security has been part of the lexicon of international development since the establishment of the United Nations Food and Agriculture Organisation (FAO) in 1945 marking a significant moment in history for its attempts to with inequities in the production and distribution of food at a global level. However, the concept of 'food security' has always been in contention, with practical notions focussed on production techniques, global food markets and structural adjustment programs vying with rights based approaches, principles of entitlement and with broader poverty reduction programs. The widely quoted FAO definition of food security as 'a situation that exists 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' has been criticised for its absolutism and neglect of agency (Shepherd, 2012). In other words because this notion of food security is only realised when experienced by 'all people, at all times'; there is little consideration (in the definition at least) of the myriad steps that might be taken in reaching this goal. Similarly, in focusing on an end state, little is said about the agencies and institutions that might take the necessary steps, although market mechanisms and adjustments to them alongside technological developments are often presumed to be the most relevant.

New concepts of food sovereignty and food democracy are now proposed by those dissatisfied with the limitations of established notions of food security. Both entail a more active (and activist) rights-based approach to achieving the end state described in the FAO definition and both typically focus on the rights of small scale producers to engage in more sustainable forms of agriculture and of consumers to access fair trade systems when buying their food (IPC, 2007; Lang, 2008). Movements and institutions based on the principles of food sovereignty and food democracy, such as the International Planning Committee for Food Sovereignty, the International Peasant Movement – *La Via Campesina*, and local groups such as Food First in Oakland, CA., tend to place food at the centre of much broader campaigns to transform the social, political and economic relations that give rise to hunger and other forms of injustice.

The outcome of food insecurity is most pronounced in the developing countries of the global south, but is no longer confined to them, and as most of the world's population now lives in cities, it is as much an urban as a rural phenomenon. The complex and changing relationship between rural areas of food production and urban areas of food consumption now lies at the centre of the challenge of achieving greater food security, food sovereignty, and food democracy.

This study focuses on food security in Australian cities in the context of climate change. To some this is a relatively minor issue as by global standards most Australians have access to safe and nutritious food that meets their dietary needs; indeed Australia produces much more food than it consumes and has a substantial food export sector. However, a number of problems exist within this generally successful national food system:

- global economic change (especially fluctuating exchange rates) is affecting the profitability and viability of many Australian exports, including of food;

- rising fuel prices are adversely affecting the transportation costs of food that is exported from and imported into Australia as well as distribution costs within the country;
- valuable agricultural land, especially on the fringes of cities, is being lost to urban development;
- climate change is affecting the productivity and viability of growing regions throughout Australia, often detrimentally;
- younger people are not entering or remaining in farming (in all its forms) at the same rate as among previous generations;
- the duopoly of major food retailers is driving down the price of many foodstuffs to the detriment of smaller farmers and producers;
- entrenched poverty is undermining the capacity of some Australians to access nutritious food;
- in some remote settlements, access to nutritious food (especially fresh fruit and vegetables) is extremely poor and prices comparatively high.

At the same time there is evidence of a growing interest in the quality, freshness, provenance, and price of food, and increasing demand for food that is locally produced and seasonal. While interest in these matters is most pronounced among middle class Australians it would be inaccurate to describe it (or to dismiss it) as a metropolitan, middle class preoccupation. Indeed only one or two generations ago it was commonplace for most Australians to use their suburban gardens to produce a significant proportion of the fresh fruit and vegetables they consumed and although a greater proportion now live in apartments without private garden space or in suburban settings where the backyard is now considerably smaller than it once was (Hall, 2009), interest in growing some of one's own food remains substantial.

Insofar as food insecurity is primarily a function of poverty, we should not be surprised that in Australian cities food insecurity is most pronounced in areas where poverty and deprivation are spatially concentrated. However, it is also a pressing problem for poor households living in relatively affluent areas. It is also a feature of remote settlements where poverty and remoteness combine to limit the availability of nutritious food. There is little evidence that geographical patterns of food insecurity in Australian cities merit the designation 'food desert' – definitions of the term vary along a continuum from absolute to relative conceptions. A recent systematic review by Beaulac et al. (2009) found only three relevant Australian studies which, again, highlighted the significance of remoteness at the national scale, and did not identify any substantial food deserts in urban areas.

Australian cities emerged historically as a place to dispose of agricultural surplus and a place where food was consumed rather than produced. This is not to say that small-scale food production and processing is absent from cities, but that cities typically rely to varying degrees on food that is grown and processed elsewhere. As food preservation and transport technologies evolved, so global markets emerged that allowed cities to be supplied by places of production throughout the world as well as from their traditional rural hinterlands. The length and complexity of these supply chains has introduced a new form of insecurity for urban populations as their food supplies become vulnerable to a variety of disruptions that can come from many

quarters: economic crises; fuel shortages; local transport network failures; and extreme weather events.

Thus, while the impacts of climate change on Australian agriculture are well documented, its effect on the supply of food to Australian cities has not so far been the focus of research or policy attention. Recent events such as the Queensland floods of 2010/11 show the consequences of serious disruptions to the supply of food to cities by, in this case, extreme weather events.

Planning to make cities more capable of dealing with substantial existential threats is often part of a broader program of building urban resilience. An important element in building greater urban resilience is the development of local capacities, services and infrastructure rather than continuing to rely on external sources and broader network connections. Resilience can involve 'target hardening' in which urban systems become better able to withstand external shocks and threats, and 'bounce-back-ability' or the ability to experience but recover from these shocks and threats.

Consuming more food that is grown within cities and their immediate hinterland can, therefore, be an important part of these broader programs to build greater urban resilience. While few suggest that all or even a majority of a city's food requirements can be met by local production, greater local production reduces the vulnerability associated with dependence on long supply chains that are becoming more fragile.

Quantifying the capacity of more localised production systems or urban agriculture, to meet greater urban food requirements is difficult as the factors that promote and inhibit movement in this direction are many. In a situation where most people are happy to rely for most if not all of their food on supermarkets (and restaurants etc.) that employ just-in-time supply systems, and where major disruptions are rare, then the pressure to change is likely to be minimal and urban food growing small in scale and limited to enthusiasts and aficionados. On the other hand, if disruptions become more commonplace, dissatisfaction with current food systems continues to grow and enthusiasm for local growing continues to rise, then the pressure for change could become substantial. Historically (e.g. in times of war) and in other places (e.g. in post-Soviet era Cuba) we have seen how circumstances have forced cities to produce much more of their food locally.

While there is a growing body of research describing the development, experience and impact of local food growing initiatives in a number of cities around the world, there is less research based on Australian experience. However, the need for this research is increasingly recognised in Australia which has one of the highest proportions of urban population in the world and where the impacts of climate change on this population are likely to be substantial.

This report presents the results of a study of food security in urban areas in the context of a changing climate. It was commissioned by NCCARF as a synthesis and integrative study within its program of work on ensuring secure food supplies for Australia under climate change. Unlike other projects commissioned under this heading, this study focussed on the cities of Australia, where the majority of Australians live.

In response to the existential threats described above, there are moves to develop new approaches to building greater resilience in cities. Many of these involve a degree of re-localisation to reduce dependence on long and possibly vulnerable supply lines for food, energy, water, finance and waste disposal. In this context, urban agriculture has re-emerged as a matter of public and policy debate within cities. While for some urban agriculture is a contradiction in terms, it has long been recognised by city and local governments and been subject to regulation. An important aspect of this research has been to review studies of these regulatory regimes and to consider how these operate in practice as supporters of or barriers to the expansion of local food production and processing.

The research on which this report is based involved two complementary strands. The first comprised a review of the literature: on notions of food security and related concepts such as food sovereignty; on current patterns of urban agriculture and its contribution to the consumption profile of urban populations; the impact of climate change on these patterns of urban agriculture and on possible future patterns; and on broader conceptions of urban resilience and how urban agriculture might contribute to the strengthening of resilience in cities. The second strand involved a series of interviews with practitioners and policy makers in two case study cities in Australia: Melbourne and the Gold Coast. These case study areas were selected to reflect different historical trajectories and patterns of urban growing. They also reflect a different set of opportunities and constraints on the potential for urban agriculture to play a more prominent role in the future.

The research found a variety of perspectives, conceptions and practices in both the published literature and in the views of our sample of practitioners. While this variety sometimes served to impede productive debate, more often it reflected sincere differences of opinion that could be resolved through further dialogue. Although we learnt of some instances of outright hostility to urban agriculture, it was more common to hear of a more benign antipathy to growing food in cities. Combining a broad scale view that Australia is a country that always has and likely always will enjoy food security when seen primarily in terms of aggregate national output, with the commonplace view that food production takes places only in rural areas, we see the roots of this apathy and complacency. Given the ways in which much debate about existential threats to contemporary ways of life entails accusations of alarmism, it is not surprising that attempts to present urban agriculture as a plausible and necessary measure to promote greater urban food security are met in some quarters with scepticism.

The research also revealed that around the world, many cities are taking much more seriously the various threats to their security posed by climate change, peak oil, global economic instability and armed conflicts. Many are also recognising that because some of these threats are connected, so too should any effective response. Thus, while the nutritional impacts and benefits of backyard and small scale food production in cities may be relatively modest at present, they generate a number of other benefits, including the chance to become more aware of the provenance and quality of fresh fruit and vegetables, the opportunity to work with others in producing, processing and sharing local food and the ability to use what would otherwise be waste products that are costly to dispose of.

Although there appears to be increasing urban agricultural activity in many Australian cities and a growing body of literature exploring all aspects of urban food production, there are significant gaps to be filled by further research. Detailed local studies of soil quality, the impact of airborne pollutants, water requirements and crop yields will help improve the productivity and quality of food grown in cities and there would be great benefit in the development of more detailed downscale projections of the impacts of climate change on food growing potential in particular cities and urban areas.

In summary, the research has revealed a growing practice of urban agriculture in all its forms in Australian cities. This has the potential to make a significant contribution to increasing the resilience of Australian cities and other urban areas in a future affected by climate change and other existential threats. If integrated and comprehensive plans for building urban resilience are developed in Australia in similar ways to those now being implemented in other developed cities, then the potential of urban agriculture can be further enhanced. However, if urban agriculture is seen mainly as a marginal preoccupation among a green or metropolitan middle class minority, then many of the current barriers to its expansion will remain and it will not be capable of making a more significant contribution to greater urban resilience.

## 2. OBJECTIVES OF THE RESEARCH

Food insecurity is already a major problem in many parts of the world and it is being exacerbated by climate change. As more of the world's population lives in cities and urban areas, so the supply of food to urban populations is a major concern to governments at all levels. Urban planners (broadly defined) are attempting to deal with changing patterns of food retailing, the contribution of food to waste streams that must be managed, the cost and quality of food and its impact on public health and social exclusion. They are also attempting to plan for greater resilience in cities in the face of various threats, including those associated with climate change. Therefore, enhancing urban food security is not only an important aim in its own right, but also a significant part of wider processes of building urban resilience in the face of climate change.

It is increasingly recognised that the variety of practices that exist under the broad heading of 'urban agriculture' can contribute to achieving more secure food supplies for urban Australians. These practices range from backyard and rooftop gardening, through to community gardening and composting schemes, to the planting of edible landscapes and the establishment of new food retailing opportunities. Around many cities, peri-urban areas also offer significant opportunities for more localised food production and processing. But there are also significant barriers to the development and wider application of these practices. While some of these barriers may be biophysical and driven by climatic changes, many are social, economic and political.

This project is designed to extend our knowledge of the current diversity of urban agricultural practices in Australian cities, to identify the social, economic and political barriers to urban agriculture and to explore the potential for extending its practice in the future, especially one increasingly affected by climate change. It draws on a systematic review of current practice in Australia and beyond and supplements this with two case studies of major Australian cities.

We expect the results of this work will make a number of valuable contributions: to the development of the National Food Plan currently being prepared by the Department of Agriculture, Fisheries and Forestry, especially in relation to its concerns about climate change impacts, adaptation and mitigation; to national debate about urban food security and urban resilience; and to local debates about the development of more effective policy frameworks to support urban agriculture.

Presentations of the research findings will continue to be made at various conferences in Australia and internationally, and we hope to extend the research in the future to include more comparative analyses of urban food policy development in American and European cities.

### **3. RESEARCH ACTIVITIES AND METHODS**

#### **3.1 Research design**

This project was designed to extend our knowledge of the social, economic and political context for urban agriculture in Australia and to explore the potential for extending its practice in the future. As originally conceived, it comprised four main elements:

4. a systematic review of existing studies of urban agriculture in Australia and elsewhere, including any studies of the barriers to its extension and of the likely impact of climate change on the patterns and viability of various urban agricultural practices in Australian cities. These reviews will build on work already undertaken at Griffith University and The University of Queensland and draw on the knowledge of urban food security issues and material and the expertise of team members in conducting systematic reviews of scholarly and 'grey' literature;
5. case study research in two Australian cities, exploring the range of urban agriculture practices, including an assessment of its current and future contribution to urban food security in each locality. Each case study will comprise the collection and analysis of relevant policy material, local studies and a series of one-to-one interviews and focussed group discussions with key local stakeholders, including researchers, policy makers and practitioners from local and state governments. Melbourne and the Gold Coast were selected because of their innovations in urban agriculture & the opportunity to use existing open space in new ways;
6. an assessment of the extent to which local urban agriculture and food security strategies make a positive contribution to local climate change adaptation strategies; and,
7. an additional comparative analysis of best practice in Vancouver and other North American cities was to be undertaken as part of a collaboration between Griffith and Simon Fraser Universities, examining metropolitan food security strategies. The reduced timescale of this project made this impossible, but we hope to pursue the comparison in subsequent research.

We describe the first three of these elements in more detail below:

##### **3.1.1 Systematic reviews**

This stage of the research consisted of a review of contemporary scholarly and policy literature that focuses on food security, urban agriculture and urban resilience. It was concerned also with the actual and anticipated impacts of climate change on these elements and with the potential to improve policy and practice in the future.

While literature reviews have become a standard feature of scholarly research in recent years, in the last two decades there has been pronounced improvement in the rigour with which many have been undertaken. The rise of the so-called evidence-based policy movement saw increasing attention to quality of evidence arising in policy



debates and to the more systematic synthesis of all relevant and available evidence in a given field. The approaches developed by the Cochrane Collaboration (in the field of health care) and its sibling, the Campbell Collaboration (in the broad field of social policy) provide a robust framework for identifying the best available research on a given topic, and synthesising the results into a format most useful to policy development and evaluation. The rigorous criteria applied to the conduct of Campbell Reviews of social policy issues and interventions provide a benchmark for this review, but given a number of limitations on the time and resources available to us we were not able to meet all of the Campbell review criteria. Nevertheless, we have incorporated as many of their principles as possible in this review.

The focus of our review was on the nature (and definitions) of urban food security and urban agriculture, historical patterns of urban agriculture in Australian cities and elsewhere, the anticipated and actual impacts of climate change on urban agricultural practices and factors that might inhibit or promote more extensive urban agricultural practices in the future.

We limited our review to academic and policy, or practitioner journals – published in English, after 1990, and excluded material published in the popular media. We also focussed on research about cities within Australia and other developed countries. Some definitional material based on countries of the global south was also included. While studies were not screened for research design or methodology, the majority could be described as narrative or conceptual rather than empirical studies based on any form of experimental design. Nevertheless, a small but significant number of empirical case studies now exist, and have been included, and these appear to be growing in the totality of studies of urban food security. Given the paucity of empirical studies, no attempt was made to combine data sets and carry out any form of meta-analysis of larger data sets. Apart from the case study research described below, we were not able to carry out any analysis of primary data on agriculture in Australia or elsewhere.

A long list of material conforming to these broad criteria on the basis of their title and abstract was reviewed for relevance and a shorter list constructed, which also identified a number of analytical themes. This material was then allocated (non-exclusively) to seven thematic groups for more detailed analysis. The approach, findings and conclusions were then summarised and finally incorporated into this review. Not all of the material listed in the consolidated bibliography is referred to directly in the review but the bibliography is presented in its entirety for the sake of completeness and for reference.

### **3.1.2 Case study research**

Case study research is commonly used to explore in detail aspects of a particular case that are not amenable to large scale, extensive research methods such as surveys. While not tied to any particular method of data collection and analysis, case studies often combine quantitative and qualitative or extensive and intensive techniques to explore cases in great detail, providing what is often referred to as rich-thick descriptions (Lincoln and Guba, 1985).

Case studies should also be clear about something of theoretical significance to the study in question. In this case the case studies are of two Australian cities with rather different urban trajectories and profiles of urban agriculture. Melbourne was declared a city in 1847 (twelve years after its founding) and is now the second largest city in Australia in terms of its metropolitan area, governed by 26 city and five shire councils. The City of the Gold Coast was approved by the Queensland State Government as the name of the local authority in 1959 and the city is now the sixth largest in the country, while the local authority is the second largest in the country, after its neighbour Brisbane. While Melbourne has a long tradition of meeting many of its food needs from within its immediate hinterland, the Gold Coast remains a city that contains significant agricultural activity across its jurisdiction and where over half of all its land remains undeveloped. These two cases were selected to reflect these different historical trajectories as well as a different set of local political institutions, as part of our inquiry was to explore the institutional and regulatory environment in which urban agriculture is either helped or hindered and in which various climate adaptation policies help to frame these responses. Melbourne's history supporting food policy has emerged despite the problems it faces in attempting to coordinate an array of municipal jurisdictions and while the Gold Coast does not have a history of this type of policy support, it does not experience the same challenges of inter-jurisdictional competition and coordination.

In each case study interviews were conducted with a range of key informants, identified using snowballing techniques. These have been supplemented with documents produced by some of the relevant organisations. While the original intention was to interview approximately 15 key informants in each city, in practice, the distribution was more skewed. Due to the comparatively higher level of activity in Melbourne and a shared interest in advancing the practice of urban agriculture it was possible (and to some extent unavoidable) to interview a much larger sample. On the Gold Coast the opposite was the case and the recent elections at state and local government level produced something of a policy hiatus in advance of the elections and a preoccupation with other policy commitments after them. This has resulted in a number of officers in state and local governments moving to new areas of responsibility and not being available to participate in the study. While this distribution of interviewees between the two case study areas is uneven, we do not believe it undermines the robustness of the two case comparison approach.

In the next section we describe in more detail the nature of the fieldwork in the two case study areas.

#### *3.1.2.1 Melbourne and Gold Coast case study research methods*

Both case studies relied mainly on semi-structured, in-depth interviews, using a thematic topic guide developed by the research team early in 2012, prior to the first visits to Melbourne and the Gold Coast. A total of 63 individuals were interviewed, the majority (53) in Melbourne, with fewer (10) taking place in the Gold Coast. Most interviews were conducted face-to-face, with two conducted by telephone.

In Melbourne, 43 of these individuals are currently employed by or have direct formal institutional affiliations, with 32 separate organisations, enterprises and community groups represented. The remaining 10 individuals have no formal institutional affiliations – some never had any formal affiliation, and others had left the relevant

organisation in the past few years. On the Gold Coast, four interviewees are community gardeners, one is a food policy officer, and four are local growers who also play roles in community agriculture organisations in the city.

Drawing on the desktop literature review, as well as the research team's own knowledge of key region-specific literature, the topic guide was structured around the key research themes of food security, urban agriculture, climate change and urban resilience. There was a particular focus on exploring the nexus amongst these four themes, in order to explore, for example, the ways in which interviewees believed that climate change might affect urban agriculture; and conversely, how the practices of urban agriculture could contribute to higher levels of climate resilience in the future.

The length of the interviews ranged from 30 to 90 minutes, with most lasting approximately 60 minutes. The interviews were conducted at a location convenient to the interviewee. In many cases, this was at their workplace or home; while in others it was in an external venue such as a café.

The interviews were conducted according to an ethics protocol approved by both Griffith University and The University of Queensland's Human Research Ethics Committee's. All interviewees were given a project information sheet, describing in straightforward language the aims of the research, its design and the benefits that might flow from it. They were also informed of the way that information they gave and any opinions expressed would be used in the research and assured that they would not be identified in any subsequent publications (including having any direct quotes attributed to them) without their express consent. For that reason, we have adopted a typology of interviewees, set out below, in order to describe the type of interviewee without identifying them individually.

Potential interviewees were identified via a key informant approach. Using the networks and experience of project team members in both cities, we contacted a small number of individuals who had over a number of years played a leading role in the fields of food security, urban agriculture and sustainable food systems, and sought their recommendations for potential interviewees. Those individuals were then contacted and during the initial round of interviews we asked for their recommendations regarding other potential interviewees, also known as snowball sampling.

While we do not claim either to have identified or interviewed all the relevant individuals and organisations in this field in Melbourne and the Gold Coast, we are confident that most of those playing a significant role in local food policy development and practice have been engaged.

Interviews were recorded and notes also taken during the interviews. Most interview recordings were transcribed for use in the analysis stage.

As mentioned above, interviewees participated in this research on the understanding that their confidentiality would be protected. We have therefore adopted the following typology of interviewees in order to attribute direct quotes and opinions to them:

- state government employee
- local government employee

- non-government organisation employee
- member of community food organisation
- farmer/grower/market gardener
- independent researcher/consultant/academic
- backyard/community gardener
- not affiliated.

### **3.2 Summative assessment**

The conclusions and recommendations for governments at various levels and other relevant bodies are the product of an assessment of the evidence from both the literature review and the case studies within an analytical framework based on the notion of food systems interacting with the impacts of a changing climate.

One workshop was held in Melbourne with participants to explore with them the emerging conclusions and to seek feedback on a set of locally specific recommendations for the development of policy and practice. A workshop for Gold Coast participants is being planned but is unlikely to occur until after the publication of this report.

### **3.3 International comparison**

As the project started slightly later than originally anticipated and has to report sooner, it was not possible within the timeframe to incorporate a comparison with the experience of Vancouver through collaboration with Simon Fraser University. We hope, however, to develop this link in the future and to extend it to other cities in the USA, South America and in Europe.

## 4. RESULTS

In this section we present the main results of the study, drawing on the two main sources of data: the systematic review of the literature and field research in the two case study areas of Melbourne and the Gold Coast.

### **4.1 Results from literature review**

The literature review was organised around seven key questions and these are used to structure the findings in this section.

#### **4.1.1 What do we mean by food security?**

Australia is a major food-producing nation, with vast areas of land on which to produce bulk commodities such as, beef, grain, wool, and sheep meat for export. One of the reasons for the colonisation of Australia by the British was to exploit its natural resources and food production began soon after the arrival of the First Fleet in the 1780s to feed prisoners deported to Australia – with the aim of reducing the burden on Britain of feeding them (Lawrence, Richards and Burch, 2012). Forty years later, food from Australia began to be exported abroad, which led later to the popular conception of Australia being a ‘land of plenty’ with an economy that was ‘riding on a sheep’s back’ – highlighting the dependency of the economy on agricultural exports, particularly wool.

Following the second World War, as the food crisis in Europe deepened, there was a renewed effort in Australia to produce more food for export. Known as the ‘Food for Britain’ scheme, vast areas of land were cleared and technological innovations and new inputs were introduced to boost production and industrialise Australian farming to produce more goods for export. Today, around 60% of Australia’s total production of food is destined for overseas markets, representing 76% of the gross value of farm production (Lawrence, Richards and Lyons, 2012). While Australia does not subsidise directly its agricultural production, opting instead for an ostensibly free market approach, there are a number of regulatory mechanisms and policy measures, which modify market conditions. Nevertheless, government support for agriculture in Australia is among the lowest of OECD member states and focuses on product promotion and food safety and standards.

These historical origins of an export-led agricultural system in Australia, based upon on-going technological innovations and the adoption of European farming practices, helps set the scene for contemporary debates related to food security, including debates related to growing food for export versus domestic markets, the role of science and technology, regulation and corporate concentration. Many of these themes are linked also to broader debates about Australia’s food security, including foreign investment in and ownership of farms and cattle stations.

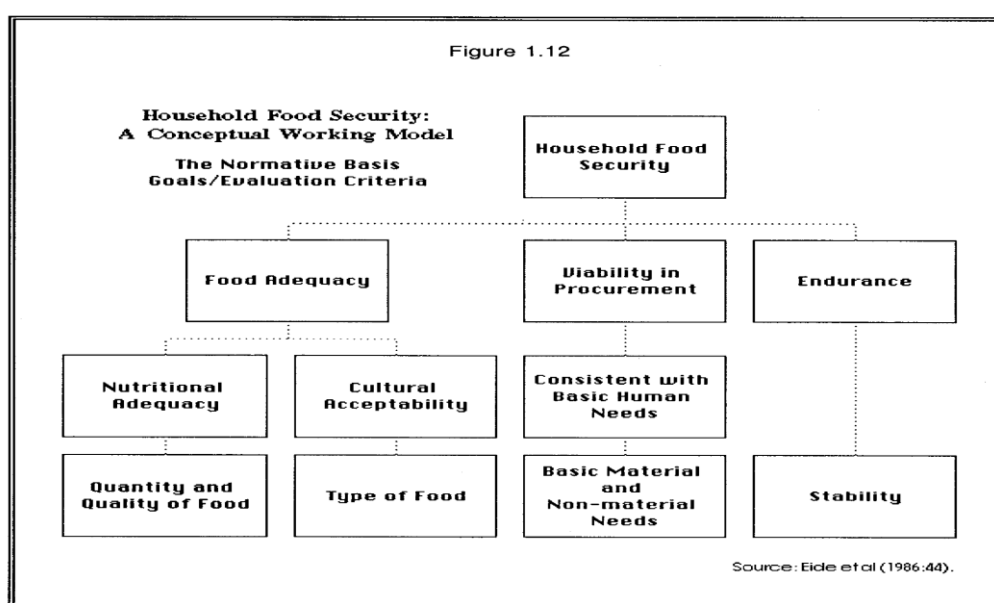
There is broad consensus that one of the major issues confronting society now and into the future is food security – a term now widely used in policy circles (see for example Lawrence, Lyons & Wallington, 2010). Concepts of food security emerged in the 1970s, and at that time focussed mainly on the capacity of regions or nations to meet the aggregate requirements of their people for food. This scale of focus tends to ignore substantial and significant variation at more local scales and consequently an

increasing emphasis was placed on the household as the most important unit of analysis in conceptualising food security.

As the UN's International Fund for Agricultural Development (IFAD) notes, food security is a constituent part of a broader concept of nutrition security, in which households have access not only to adequate food, but also to other aspects of a healthy life such as health care, an appropriately hygienic environment and awareness of the importance of personal hygiene. In this respect, food security becomes a necessary but insufficient condition for achieving household nutritional security. It should be borne in mind however, that the household scale can also mask variations and inequalities in the food security, especially in terms of gender and age in which 'intra-household issues are central' (Maxwell and Smith, no date: p. 4).

The following diagram is taken from Maxwell & Smith's (1992) conceptual review for IFAD of household food security and shows the relationship between the different elements of a relatively common conceptual model of food security, including nutritional adequacy, which is discussed in more detail below.

*Household Food Security: Concepts, Indicators, Measurements*



**Figure 1: Household Food Security: Concepts Indicators, Measurements (Maxwell & Smith, 1992)**

In Australia, the Prime Minister's Science, Engineering and Innovation Council Expert Working Group (PMSEIC), drew upon the UN Food and Agriculture Organisation's (FAO) definition, which states that:

Food security is achieved when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet dietary needs and food preferences for an active and healthy life (PMSEIC, 2011).

While early concepts of food security refer primarily to access, affordability and the availability of food (Patel, 2007), more recent definitions have shifted and over time have come to give greater emphasis to the market, technological innovation and

increasing productivity. Thus, whilst there is general agreement around the basic definition of food security – the FAO definition is widely used and cited – there is significant contestation over both the scale and the causes of food insecurity, and the responses required to ensure adequate food access for what is likely to be a growing global population. There is even greater disagreement over the extent to which food security is and should be connected with notions of sustainability.

It is important to note here that despite substantial evidence that there is currently enough food to achieve global food security, almost a billion people are considered food insecure, and at the same time, over one billion people are obese (Patel, 2008). Somewhat paradoxically, food insecurity is often linked with over-consumption and the diseases of obesity, especially amongst populations where people have access to low cost, calorie dense (including high fat and sugar content) and nutritionally poor food, an issue we take up further below in relation to the social and economic determinants of food security.

In our review of the literature, it is evident that food security is recognised as being connected to a broad range of factors, including social, economic, spatial and political factors. These typically fit within two broad categories: social and economic determinants of food security and food and nutrition systems.

#### *4.1.1.1 Social and economic determinants of food security*

Various research suggests that food security is connected to a range of social and economic factors, including the inability to afford to purchase available food; insufficient food availability; eating a nutritionally poor diet; energy poor diets; and chronic reliance on food aid/relief (see for example Browne, Laurence and Thorpe, 2009). Rychetnik and Webb et al. (2003) also identify employment, income, education, housing, area of residence and social inclusion as factors directly related to food security. Consistent with Sen's (1982) analysis, poverty appears to be a key factor limiting people's access to food. For low-income families, food may be the only flexible item in their household budget – whereas there is less flexibility on items such as rent/mortgage and utility bills. As such, households on low incomes tend to cut their food spending in order to survive.

While Australia is broadly recognised as being food secure, especially in relation to many other countries and regions of the world, disadvantaged and low-income groups are especially vulnerable in terms of food security. Recent Australian research illustrates this trend.

- Lockie and Pietsch's (2012) survey of public opinion on food security found that 16% of respondents are often or sometimes worried that their food would run out before they had money to buy more, and 4% of respondents had needed emergency assistance from a charity, food bank, soup kitchen or other source.
- Browne, Laurence and Thorpe (2009) found that 24% of Indigenous Australians reported running out of food in a 12-month period (compared to 5% amongst non-indigenous populations). In another study, 51% of Aboriginal families in Victoria reported being food insecure. Such high levels of food insecurity were recognised as being related to a range of social and economic factors, including financial stress, housing problems, budgeting issues and lack of knowledge of food preparation.

- Temple's (2006) study of older Australians found that living arrangements, age and multiple long-term health problems were strongly associated with food insecurity. His more recent study (Temple, 2008) reports on a survey of approximately 19,500 people where 5% of respondents reported running out of food and not being able to purchase more, or skipping a meal as a consequence.
- Nolan et al.'s (2006) survey of 1,719 South Western Sydney respondents also found significant levels of food insecurity, with 16% of residents reporting experiencing problems of food insecurity. The main predictors of food insecurity in households were the cost of food, capacity to save, the presence of children in the household, housing tenure and health status. Ability to access shops was also an inhibiting factor, particularly for people with disabilities, those with young children and those without cars. While car ownership may or may not be related to relative poverty, it does suggest the concept of the 'food desert' has relevance in the Australian context (Conveney and O'Dwyer, 2009; Leete et al., 2012). Dodson and Sipe's (2008) work on locational vulnerability in the face of rising fuel and mortgage costs reinforces the fact that the traditional Australian suburban landscape can exacerbate a variety of social and economic problems faced by poor households, including food insecurity.

#### *4.1.1.2 Food and nutrition systems*

This recent research in the Australian context points not only to the social and economic determinants of food security, but also highlights rifts in the distribution of food. Inequitable distribution has been linked to a number of factors related to food and nutrition systems, including the concentration of power in the food supply chains amongst retailers, food processors and wholesalers. Concerns have also been raised about the extent to which food is wasted, especially in the developed world, and the connections of high levels of waste with retailer concentration, with estimates that one third of all food produced is discarded (Gustavson et al., 2011). Research into supermarket dominated supply chains reveals a system of 'quality' standards whereby fresh food is often rejected on the basis simply of cosmetic appearance (Richards, Lawrence and Burch, 2011). In Australia, the Coles/Woolworths duopoly controls around 80% of the fresh food retail market (ACCC, 2008), leaving few alternative outlets for fresh food that does not meet their stringent standards on appearance rather than nutritional quality or seasonality.

As mentioned in the introduction, more than half of the world's population now lives in cities. This urban population has, arguably, become increasingly disconnected from the origins of the food it consumes, and increasingly reliant on a globalised economy of monetary exchange, futures trading and international regulation to access its food. Urban vulnerabilities are exacerbated when local economic resources are low, and when food grown outside of the city is compromised due to climatic variability and extreme weather events. Feeding growing city populations requires transporting food from beyond its boundaries, often from agricultural regions outside the metropolitan area, and increasingly from countries beyond the referential frame of the recipient. In short, many urban consumers have little appreciation of where their food comes from, the conditions under which it is produced and the means by which it is transported to their local shops. There are, however, signs that this is changing and that a growing number of consumers are more concerned with the provenance of their food and hence with broader issues of food security. Dixon (2011) refers to this disconnection between



people and the origins of their food as a metabolic rift, a disconnection and vulnerability that was also highlighted during this project's fieldwork in Melbourne and the Gold Coast.

The recent report from the Commission on Sustainable Agriculture and Climate Change (Beddington et al., 2011) chaired by Professor Sir John Beddington describes vividly the current state of global food security and the converging threats from climate change, population growth and the continued unsustainable use of natural resources and concludes,

*'Business as usual in our globally interconnected food system will not bring us food security and environmental sustainability' (p. 3)*

Instead the Commission recommends urgent and far reaching change,

*'To reduce the effect of climate change on food supplies, livelihoods and economies, we must greatly increase adaptive capacity in agriculture...' (p. 4)*

However, although recognising that the threats posed by climate change to food supplies 'are likely to be spatially variable' (p. 4), there is no reference at all to the urban dimensions of the problem, either in the growing concentration of the poor in urban settings or in the potential for some forms of agriculture to be based within cities or their peri-urban fringes.

Similarly, the Expert Working Group, commissioned by PMSEIC to investigate and report on Australian food security devoted little time to the urban dimension of the problem, although they did develop and articulate a more nuanced analysis of the problem than earlier and simpler conceptions. In his foreword to their 2010 report on Australian food security in a changing world (PMSEIC, 2010:v), the chair of the expert working group, Professor Peter Langridge noted that:

*In Australia, we have had an abundance of food. We can produce more food than we need and we have the resources to import food if necessary. However, we have faced crises for specific foods, such as the banana shortage after Tropical Cyclone Larry in 2006. **Further, our food transport, distribution and storage systems are vulnerable to disruption...Perhaps Australia's most serious food security issue relates to the ways in which we consume and use food.** (emphasis added)*

Thus, while the report acknowledges the significant vulnerability of Australian agriculture to climate change and variability, to increasing land degradation and to increasing reliance on imported fertilisers, it says little about the urban dimension to these problems. There is however some recognition of the importance of better engaging a broader spectrum of the community in building their appreciation of food, nutrition and supply chains. The logic of this approach is that by building greater appreciation of the importance of food and especially of good quality and nutritious food, people's demand will drive innovation in the food production and processing sectors in a positive manner:

*A community which is informed about the food value chain and making appropriate food choices will exert a positive influence on food innovation. (PMSEIC, 2010: 60)*

The consequences of Australian urbanisation are also noted:

*Australia has become a highly urbanised community with connections to agriculture being eroded and fewer people having direct connections to farming. From this perspective, this would appear to have resulted in a loss of respect for food with resultant waste, declining support for rural communities and lower intakes in agricultural and food technology training programs. The recent droughts and water restrictions in major cities have, however, reignited rural links and presented an opportunity for increasing interest and awareness of agricultural production. (PMSEIC, 2010: 60)*

The report notes an apparent waning of interest in agriculture and food production and a rural/urban divide, but fails to recognise at all any interest in the production of food within urban areas, either at a small scale for personal use, via community gardens or at the small to medium commercial scale within or on the fringes of cities. It is not clear from the report whether this urban dimension was ignored from the outset or considered and then dismissed as insignificant or irrelevant, but it would appear to be something of a lacuna in its perspective on the future of Australian food security.

In summary, over the last forty years the concept of food security has informed policy debate at the international, national and local levels. The concept has, however, undergone a number of changes and challenges although as Maxwell (1996:155) noted some time ago, 'food security had become, it seems, a cornucopia of ideas' with a plethora of definitions. Indeed twenty years ago, Smith et al, (1993) found close to two hundred different definitions of the term. Nevertheless, it is possible to identify some broad categories and periods in this definitional development: from the global to the national to the household in focus; from a food supply to household and individual livelihood perspective; and from objective indicators to subjective perceptions (Maxwell, 1996:156). But in all of these changes we see little attention being paid to the urban dimension of the issue, except in recognising that food security and poverty are connected and that the poor are increasingly found in cities.

We return to this gap below when considering in more detail the role and potential of urban agriculture in building greater urban food security.

#### **4.1.2 How is food security likely to be impacted by climate change?**

The effects of climate change are likely to exacerbate a range of existing problems with food supply, including the problem of food security and food colonisation. Morgan & Sonnino (2010) have coined the phrase 'the new food equation' to describe the constellation of complex new developments that have obliged politicians and planners to treat food policy more seriously. This constellation includes the food price surge of 2007/08, which led to a sharp rise in global food insecurity. This contributed to the current framing of food security as a matter of national security and may be leading to new forms of 'food colonialism' (Morgan & Sonnino, 2009:210) whereby cash rich but food poor countries systematically buy up the productive capacity of poorer countries. Rapid urbanisation in many countries is also raising concerns about the resilience of

urban food supply chains. Thus, while the effects of more variable rainfall patterns, more very hot days, more severe storms and changing patterns of vector borne diseases are likely to have profound effects on traditional agricultural practices in general, they will also affect urban agriculture.

In Australia, the climate projections from the CSIRO and the Bureau of Meteorology (CSIRO 2007) show which elements of significance to agriculture will change most under climate change. The National Food Plan consultation document (DAFF, 2011) presents projections which show that:

- Temperatures in Australia could increase by 2.2°C to 5°C by 2070;
- Annual rainfall in south-west Australia could reduce by up to 10%, and by 2 to 5% elsewhere in southern Australia;
- Drought occurrence could increase over most of Australia, but particularly in south-west Australia;
- Australia's climate will remain highly variable with the early effects of climate change being felt through gradual changes in mean temperature, as well as through likely changes in the frequency, duration and/or intensity of extreme events, such as droughts, heatwaves, fires and floods;
- Although there may be more dry days, when it does rain, rainfall may be heavier than previously experienced in the region;
- Hot days and warm nights are projected to become more frequent.

Climate changes are likely to affect agriculture productivity in a number of ways, due to plant and animal heat stress, less predictable seasons, crop and livestock losses from flood and drought and changes in the regional suitability of certain production systems.

One of the most significant reviews of food security in Australia is included in the recent report from PMSEIC (2010), entitled *Australian and Food Security in a Changing World*. This notes that climate change will have a number of direct impacts on food production as a result of changing patterns of rainfall, more very hot days and soil erosion. However, there are also likely to be significant indirect effects such as disruptions to supply lines as a result of floods, cyclones and more very hot days. Nonetheless, a government view as portrayed by the Australian Bureau of Agricultural and Resource Economics (ABARE) is relatively sanguine. While Australia's economic output is likely to be affected by climate change effects on agriculture, in the long term, climate change does not present a substantial physical threat to Australia's physical food security (Sheales and Gunning-Grant, 2009). In addition, trade and participation in the global economy is likely to continue to buffer the impact of threats to Australia's food security (Moir and Morris, 2011).

While the policy discourse is relatively stable around the findings of the CSIRO and the assumption that trade and open markets will prevent a food security risk in Australia, an emerging body of scientific literature is providing a more nuanced and critical view of the impacts of climate change compared to the government's responses. For example, Bloom et al., (2010) show that as atmospheric CO<sub>2</sub> rises, plants (in this case, wheat and *Arabidopsis*) will have more trouble absorbing nitrates into their tissues

through two well-known mechanisms. The authors argue that this is important because the lack of nitrogen in plants will lead to a reduction of the protein content and therefore the nutritional quality of food. Devereux and Edwards (2004) argue that most climate models predict catastrophic consequences for food security in regions, while often ignoring the potential impacts of improved technology and adaptive behaviour. They note that this emphasis on models of agricultural consequences is often at the expense of a more systematic consideration of political responses. Vermeulen et al., (2010) concentrate on some of the ways that agricultural risks associated with increasing climate variability and extreme events might be better managed. For example improved climate information services and accelerated adaptation to progressive climate change over decadal time scales through integrated packages of technology, agronomy and policy options for farmers and food systems all have the potential to mitigate the effects climate change. This literature provides fresh insights into how climate change will affect food production and supply but also suggests other mechanisms for adaptation.

Australian agriculture is highly dependent on the climate and its variability and is indeed 'a land of droughts and flooding rains'. Climate affects almost every aspect of food production from the plants and animals used, average production and production variability, product quality, which areas are farmed, what soil types are preferred, the management systems and technologies used, input costs, product prices and natural resource management. It follows that if the climate changes, many aspects of food production will change too (PMSEIC, 2010:12) and these anticipated impacts are likely to be, on balance, negative rather than positive although there may be new opportunities in a changed environment.

In their review of the connections between food systems, climate change and health, Edwards et al., (2010) conclude that climate change will affect food systems and health by impacting (usually negatively) the quantity, quality and affordability of food, bearing in mind that Australia

*... has one of the most concentrated food supplies of any country, being dominated by two large supermarket chains...[in which] the food logistics system is built around the principle of just-in-time movement of freight reducing inefficiency under normal circumstances but which leaves no margins in the event of a disaster. (p. 20)*

Using a food systems approach (i.e. one which recognises the existence and interconnectedness of a range of elements: growing, harvesting, processing, packaging, transporting, marketing, consumption and disposal) they note that although 'most Australians have available (albeit not equally accessible) a relatively abundant, diverse, cheap and safe food supply...diet-related behaviours contribute significantly to the burden of disease.' (p. 3). In other words, while we are less exposed to the diseases of malnutrition, we are more exposed to those associated with the over-consumption of processed foods at the expense of fresh fruit and vegetables.

However, although the Australian food system can produce more than enough for domestic consumption and indeed can play an important role in supplying other parts of the world, its internal supply lines are vulnerable to disruption by extreme weather events which are likely to get worse as the climate changes.

This logistics system is dominated by road transport, with almost 95% of all food for human and animal consumption (by total volume) using this mode and accounting for 22% of the total tonne-kilometres travelled as Australian road freight. Clearly, any disruption to this network of roads is likely to have a significant negative impact on the movement of food around the country and ultimately on its cost.

Thus, while the long term impacts of climate change on Australian agriculture and its capacity to provide food for both domestic consumption and international export are profound, in the shorter term the impact is more likely to be seen in disruptions to supply lines as roads are damaged as well as to more localised crop failures due extreme weather events. Edwards et al., notes also that the distribution of fertilisers and petroleum products on which Australian agriculture has become increasingly dependent are also exposed to these potential disruptions to the national and regional road network.

In their consideration of possible responses by components of Australian food systems to a changing climate, Edwards et al., identify changes in the location of production and processing sites; changes in shopping behaviour (including even more consumption of unhealthy processed foods which cost less than healthier fresh foods); and community responses in urban areas such as new forms of production and distribution. Here the question of scale and significance is important and they note:

*Although seemingly meagre set against the sheer scale of the formal economy, these pockets of change reveal patterns of community understanding and concern, ideas and innovation that have the potential to grow. (p. 24)*

Furthermore, and as part of broader programs to build urban resilience, greater urban food growing and processing can make a valuable contribution:

*The urban relocation of food growing, if well managed, could boost certain fresh food supplies while complementing rural crops, in addition to encouraging new urban food related services, introducing urban food models and change in roles from consumer to producer for citizens. Urban agriculture could also reduce vulnerability to food supply disruptions or extended emergency supply situations by providing diverse sources of perishable food supply. (p. 24)*

We return to these issues later when considering in more detail the role of urban agriculture.

Overall, there is a tendency in some of the literature to rely on general models of the likely impacts of climate change on food security and also on the food security of cities, but not to describe more detailed studies of local impacts in specific places. We can, nevertheless, expect these general models not only to improve over time but perhaps more importantly to allow the generation of more localised models of impact through processes of downscaling. However, it is likely that without a concerted effort to draw also on a variety of local studies, the field will continue to be characterised by an unhelpful degree of ignorance and fragmentation. While it is unlikely that any one paradigm of research design will prevail, the challenge of producing coherent syntheses of methodologically diverse local studies will remain.

#### **4.1.3 What do we mean by urban agriculture?**

Despite the continued existence and indeed expansion of a wide range of food production activities in cities, as Pires (2011) notes, the very notion of urban agriculture is seen by some as a contradiction in terms – agriculture being something that happens beyond cities in rural areas. Bartling (2012) traces the ways in which post-war urban culture, especially in the USA, celebrated the proliferation of consumption over production and presented a set of practices and behaviours that were ‘appropriate’ for urban and suburban life. Increasingly this defined urban animal husbandry and food production as ‘inappropriate’ and although there is now clear evidence of a large and growing counter-cultural response to this, the relationships between ‘natural’ and built environments and between humans and nature continue to influence contemporary urban policy debates, albeit often in subtle ways (Turner, Nakamura & Dinetti, 2004; Register, 2006).

Most definitions of urban agriculture include a variety of activities carried out at many different scales, from the domestic to the citywide. Although definitions vary to some extent by region and country, they are increasingly embracing this wider range of activities.

Hodgson et al. (2011) offer one such comprehensive definition:

*Urban agriculture encompasses far more than private and community gardens. It is typically defined as the production of fruits and vegetables, raising of animals, and cultivation of fish for local sale and consumption. A more holistic systems definition acknowledges the connection between urban agriculture and the larger food system, as well its influence and dependence on a variety of economic, environmental, and social resources.*

They note also the other important but less common urban agricultural activities, including:

- institutional and demonstration gardens
- edible landscaping
- hobby and commercial bee, poultry and animal keeping
- urban and peri-urban farms
- hybrid forms that integrate gardening and farming.

Mougeot (2000) has argued strongly for bringing urban agriculture to its ‘conceptual maturity’ so that it is better able to help us understand it as an activity and press for greater intervention to support it. Whether we or not we welcome the phenomenon, the expression ‘urban agriculture’, originally used only by scholars and the media, has now been adopted by UN agencies such as the UNDP and is increasingly being considered by urban and metropolitan governments in broader considerations of urban resilience.

Mougeot’s approach is to integrate various conceptual building blocks for a more comprehensive definition of urban agriculture: the types of economic activity involved; the categories of food and non-food items produced; the locations where it is practised; the relations between urban and peri-urban systems; the nature of production systems; the scale of production; and product destinations.

Like Hodgson et al., as per definition above – this leads Mougeot to offer this more comprehensive and consistent definition:

*Urban agriculture is an industry located within or on the fringe of a town, a city or a metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-)using largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area.*

As shown later in this report, not all urban food growers identify with the term urban agriculture, and many do not conceive of it as an 'industry'. Indeed, many of the activities as well as the informal networks of food distribution that exist under the umbrella term of 'urban agriculture' occur outside of the formal economy through practices such as gleaning, food swapping and sharing.

In an annotated bibliography of urban agriculture prepared for the Swedish International Development Agency (Sida), De Zeeuw notes that:

*Urban agriculture is not easy to define since a large variety of urban farming systems can be encountered, with varying characteristics according to local socio-economic, physio-geographic and political conditions. (p. 7)*

In contrast to agriculture, or more specifically, rural agriculture – urban agriculture is described as agriculture:

*... that it is integrated into the urban economic and ecological system...It is not its urban location which distinguishes urban from rural agriculture, but the fact it is embedded in and interacts with the urban ecosystem. (p. 9)*

In the cities of developing countries, local food production is often a response to inadequate, unreliable and irregular access to food as well as to poverty or lack of purchasing power. In Australian cities the motivations are generally speaking different. They often reflect concerns with the provenance of food, a desire to reduce the distance food has to travel before it is consumed, and a wish to reconnect with nature by growing more of the food one consumes. While these imperatives may be less pressing than those facing city dwellers in developing countries, they reflect a set of preferences and motivations among city dwellers, which appear to be growing. (Ladner, 2011; Steel, 2008) as part of a wider movement to change urban lifestyles to less consumptive and more sustainable forms [for example Gleeson, 2009; slow cities, transition towns, etc.]. These broader dispositions help shape the prevailing conceptions of urban agriculture in Australia.

#### **4.1.4 How might urban agriculture contribute to greater food security?**

There are few studies that attempt to measure systematically the impact of any urban agricultural activity in relation to broader notions of food security. Indeed, as Burns (2004) notes,

Currently, there are no known systematic reviews of the effectiveness of community food security interventions [...] There have been a small number of non-systematic

reviews of community food security interventions conducted and these have identified the need for more rigorous evaluation and the importance of highlighting the process issues in program implementation (p. 4).

However, urban agriculture is widely held (Browne et al., 2009; Condon et al., 2010; PMSEIC, 2010; Brown & Carter, 2003; de Zeeuw & Dubbeling, 2009; Havaligi, 2009; Burns et al., 2010) to offer a number of benefits in relation to broad conceptions of food security. For example, one of the most common forms of urban agriculture in cities of the developed world are community gardens, run by community groups, churches or schools and often with the support of local governments. Browne et al., (2009) describe a number of their benefits:

*Community gardens increase access to fresh fruit and vegetables, particularly for participants, and provide opportunities for physical activity, community pride and social interaction through gardening. (p. 12)*

While:

*The value of school based gardens is that learning about gardening, composting, healthy eating and cooking can be integrated into the school curriculum in a positive and practical way. (p. 12)*

They also describe the long established practice of municipal allotments in the UK, where small plots of land are leased very cheaply to local residents so that they can grow their own produce. In these settings communal activities may occur but are not an expectation or requirement of the lease, which typically requires only that the plot is kept free from invasive weeds.

PMSEIC (2010) acknowledges the range of benefits and motivations for urban food production:

*There is evidence that the increased production of food in urban environments is in response to heightened awareness of the environmental impacts of food production, food transport costs and the costs of inputs such as energy and water. The urban production of food can have a range of social, environmental and health benefits that address issues of food security. These include increasing the consumption of fresh foods, developing and strengthening communities, providing culturally appropriate foods and increasing awareness of food production systems. (p. 44)*

Urban agriculture is seen in this view to be both a response to greater public awareness of the quality and price of fresh locally grown food, and as a means of raising awareness even further.

The social and transformative capacity of urban agriculture is described by Havaligi (2009) as part of a 'multi-pronged tool' for climate change adaptation and mitigation:

*Urban Agriculture is important for its productive acreage but it is more important from the perspective of transforming urban dwellers from being consumers into a community of co-producers. By participating in UA, people can develop a deeper understanding for food and respect for the farmers who dedicate their lives to growing it. By networking with local farms in a 150-mile radius cities can become*



*resilient, powerful by being locally adapted to the regional food system. Cities can move towards zero waste goals by using UA to utilise the organic fertility generated by the city. The 'waste' will be captured and kept within the regional system in form of carrying capacity of the region. Urban Agriculture is also an economic and social tool which in very simple ways will provide employment opportunities, opportunities for social networking and working together as a community. It will reduce the carbon footprint of city dwellers and decrease their dependence on fossil fuels. (p. 15)*

Dietary benefits are recognised by Kortright & Wakefield (2011) in their study of edible backyards:

*The most significant impact of home food gardening on food security found was its ability to enhance the accessibility and nutritional value of the diets of the gardeners interviewed. Although affordability of food was not a key issue, having a garden allowed respondents a greater diversity of fresh and nutritious produce than they might purchase otherwise. This is an important benefit of food gardening for all households, regardless of income level. The process of everyday engagement with food gardens also changed the gardeners' approach to food. It is likely that all of the gardeners improved the sustainability and environmental impact of their diet, another key element of community food security, by growing at least some of their food at home, entirely outside the industrial food system. (p. 51)*

However, these benefits are more individual than social:

*Food gardening is immediate and personal, forcing us to deal not only with what and how much we eat but also where it comes from and what it means to us. Home food growing can contribute to community food security not only by helping to address issues of nutrition and access but also by improving the sustainability, health, and well-being of individuals and families. The increased level of self-reliance and of food system knowledge seen among research participants both provide important supports to community food security. However, the individualised nature of much of the home gardening seen here suggests that home gardening does not, in and of itself, contribute to community development. (p. 51)*

Conceptually, urban agriculture reflects not only a spatial locale for food growing, but a re-localised system of production characterised by short supply chains. Academic and policy debate remains over the relative vulnerabilities and strengths of short and long supply chains in general in terms of resilience to 'systemic shocks' such as climate change, oil shortages, strikes and extreme weather events. Similar debate continues over the benefits and costs of localising food production and supply and over the application of concepts such as 'food miles' to these processes (see for example Barclay, 2012; Desrochers & Shimizu, 2008; Keogh, 2012; Smith, Watkiss, Tweddle et al., 2005).

The emergence of long national and international supply chains is a particularly significant element in terms of food security and resilience. Long supply chains are

based on 'just-in-time' principles that have been widely adopted by industry as a way of generating efficiencies, especially by reducing the costs of maintaining and holding stock. Long supply chains have been identified as sources of food insecurity (Gertel, 2005), since no stocks or reserves of food are held anywhere along the supply chain. While long supply chains financially benefit the major supermarkets chains by reducing storage costs (Barling & Lang, 2005), they leave communities vulnerable when supermarkets are the only place to buy food, and their supply chains and distribution networks are disrupted. To address food insecurity, some researchers have advocated the maintenance of shorter (i.e. local and regional) supply chains as they have the potential to ensure more consistent food availability, diversity and security (Marsden et al., 2000; Ilbery et al., 2004).

Long supply chain vulnerability was experienced in Brisbane in 2011 when major flooding saw the closure of the central wholesale fruit and vegetable market in Rocklea. With the key fruit and vegetable wholesalers under water, supermarket shelves quickly emptied as panic-buying set in. Similarly, a pamphlet entitled 'Nine meals from Anarchy' by Andrew Simms (2008) of the New Economics Foundation in the UK describes the impact of strikes (for example by the drivers of petrol tankers) in bringing the UK food distribution system quickly to a standstill. In this situation, with city-based retailers only carrying enough food for three days (or nine meals) the vulnerability of an oil-dependent and long supply chain system becomes unsettlingly clear. Long supply chains contain multiple, inbuilt vulnerabilities in relation to the very real threats of peak oil and climate-related natural disasters. Urban agriculture, as a more local and diverse system has the potential to bring some degree of control of the food system closer to consumers, providing access to a cheap and nutritional source of food, and in doing so, mitigate some of the negative effects associated with a more oil-dependent, global food system.

#### **4.1.5 What is the extent and impact of urban agriculture in Australian cities?**

From an historical perspective it is interesting to note that while some see the contemporary city as place a where agriculture does and should not exist, cities until recently were significant places of primary food production as well as processing and consumption. However, cities have never been self-sufficient in food and as Steel (2008:72) notes:

*It can be tempting to hark back to a golden age when all food was produced and consumed locally, with no more than a short trip 'from field to fork'. But of course no such age ever existed.*

From the cities of ancient Greece, through imperial Rome to the mercantile cities of northern Europe in the Middle Ages, cities have relied on food grown elsewhere to meet their needs, partly because of its cheapness when compared to local products and partly because as cities grew they converted their peri-urban farmland to urban uses, mainly for housing. These factors continue to influence the structure of urban and metropolitan food systems in Australian cities.

As noted above, in contemporary cities urban food production takes many forms and is often informally organised, making it difficult therefore to accurately gauge its extent,

volume or even its contribution to prevailing patterns of food supply and formal surveys of urban agricultural activity (to the extent that they exist) tend to under-report this wide range of activity (Yeatman, 2008). However, data collected by the Australian Bureau of Statistics in 1992 (the most recent survey of home food production) found that over one third of the population produced food in domestic spaces. More recently, in 2010, the Australian City Farms and Community Gardens Network listed at least 212 community gardens, while the Australian Farmers Market Association provided a list of 149 farmers markets, though not all are located in urban areas. There is also numerous community-supported agriculture (CSA) and food swap schemes, as well as hundreds of edible school gardens, including those supported by the renowned Stephanie Alexander Kitchen School Garden program, founded in 2001. There are active 'permablitz' communities in the capital cities of every state and territory in Australia.

Permablitzing – a hybridization of permaculture and the 'Backyard Blitz' phenomenon – involves communities coming together to transform backyards, abandoned blocks and other spaces into edible landscapes, or as one permablitz activist described it: 'eating the suburbs, one backyard at a time'. 'Guerrilla gardening' is also gaining increasing national attention, including its increased popularisation via a commercial television program where the stars 'fight the filth with forks and flowers'. The arsenal of guerrilla gardeners includes 'weapons of mass re-vegetation'; referring to seed guns or seed bombs made of clay, organic compost, local native seeds and water, that are then tossed into neglected spaces to germinate.

In summary, few cities in Australia or indeed elsewhere have conducted comprehensive and rigorous studies of the extent of urban agriculture. While it is relatively straightforward to count the number of community gardens, city farms, allotments, or farmers markets in any place it is less easy to identify and count domestic gardens in which fruit and vegetables are grown, food-swapping initiatives, informal gardening support groups and schemes to divert urban waste streams into compost. Similarly, it would require a substantial and well-designed survey of local residents to gauge the extent to which individuals participated in one way or another in this wide range of practices. Smaller scale mapping exercises are becoming more common, especially those undertaken by university students as part of research projects, but it can be difficult to catalogue these and to aggregate them into more comprehensive citywide profiles.

Just as there are relatively few comprehensive surveys of the extent of urban agriculture in Australian cities, so too is there a paucity of quantitative studies of its effects and impacts. There are, however, numerous descriptive and ethnographic accounts of various urban agricultural practices in various cities around the world that provide something of a foundation. While ethnographic accounts provide important insights into individual motivations to develop agricultural practices within cities and into the experience of gardening, gleaning and so on, more extensive, systematic and quantitative accounts offer a valuable complement and would help produce a more rounded picture.

Many studies rely on general perceptions of the benefits of urban agriculture when considering local impacts. Lovell (2010) for example studied community gardens in US cities and concluded that '... the social value of urban green space is not negligible.'

and claimed that community gardens can ‘... improve psychological well-being and social relations [and] facilitate healing’ (p. 22). Nasr et al. (2010) examined what it would take to scale up urban agriculture in Vancouver and in doing so identified a number of beneficial impacts, including:

- health benefits from growing and consuming one’s own food;
- increased employment opportunities for new urban farmers;
- more food from local sources with attendant reductions in greenhouse gas emissions;
- more efficient use of municipal organic waste;
- heightened public awareness of food sources and food quality.

While these presumed benefits may well be valid, very few studies have attempted to measure with any degree of empirical precision these claims, which remain therefore typically as statements of the possible.

Some more empirical impact studies are however emerging in Australia. Gosh (2011) has estimated the potential contribution of suburban home garden food production and suggests they could produce between 800–1100kg of produce per annum; enough to meet a typical household’s requirements for fresh vegetables and produce a small surplus of fruit. In a similar vein, Francis (quoted in Ghosh, p. 2) claims that:

*The lawn space of the suburbs, if put into intensive food production has the potential to out-produce the yields of commercial agriculture previously practiced on that land and provide most of our fresh food needs.*

Edwards (2011) reports not only the growth of urban agriculture in Melbourne, Victoria, but also some of the impacts, particularly in relation to community building, the promotion of healthy diets and the creation of new spaces for people with mental health problems and disabilities. These positive impacts extend beyond those of food security and highlight the many advantages, of urban agriculture, including building greater resilience among urban populations. Shelton and Frieser (2009) study identifies the positive impacts of urban agriculture on the Sunshine Coast in Queensland, highlighting the heavy dependence of the current food system on fossil fuels, which creates vulnerabilities in the face of a pending ‘peak oil’ crisis and rising fuel costs. Local food systems that are decentralised and less complex are claimed to be a more robust model for this region that will help mitigate the effects of peak oil and adapt to climate change, whilst the production of more staple foods within the urban footprint can help alleviate food shortages in times of transport crisis or other disruptions to the distribution system.

The positive impacts of urban agriculture clearly extend beyond the production of food. For instance, Corkery (2004) found that a community garden at Sydney’s Waterloo Public Housing Estate presented a wide range of benefits to residents, including social and cultural expression, community building and informal education about social and environmental sustainability. These characteristics might be considered to be some of the key ingredients of greater community resilience if society is to respond to some of the predicted ‘global shocks’ associated with peak oil and climate change. This again highlights the complexity of urban agriculture and the impact that collaborative efforts in

community food growing can have on society and the environment in addition to the calorific and nutritional benefits obtained from locally-grown food.

#### **4.1.6 What are the barriers to the more widespread adoption of urban agriculture in Australian cities?**

Little now happens in cities of the developed world, including Australian cities, that is not subject in some way to regulation by the institutions of government or by legislation. Buildings cannot be erected, land uses changed, commercial activities undertaken, social activities carried out on public land without obtaining the requisite permit, approval or licence. Moreover, if the necessary approval has not been granted (and sometimes even if it has), the relevant authority will often be contacted by a disgruntled citizen concerned with nuisance from 'inappropriate' activities.

When Australian cities grew in the 19th century the rights of property owners – taken for granted; included the right to cultivate their own property, and to keep an assortment of animals for food. Since then a range of concerns, primarily about public health, neighbourliness and local amenity have presaged the introduction of a complex web of regulations that limit the scope and practices of urban agriculture.

Proposals to relax local regulations covering the keeping of chickens and other animals on properties in the city of the Gold Coast were met with somewhat predictable responses which illustrate the persistence of debates about the proper place of 'rural' activities in urban areas. The Chair of the Cultural and Community Development Committee of Gold Coast City Council was quoted as saying:

*Would you like to live next door to someone who's got chickens clucking around plus the potential smell and everything else that comes with it...It's not like a pet, a companion like a cat or a dog, and I think if you want to do that, suburbia is not the place for that, I really don't think it is, so I totally disagree with it. (Gold Coast Bulletin, 2 March 2010, accessed online 16 October 2012: <http://www.goldcoast.qld.gov.au/council/cr-robert-la-castra-768.html>).*

A similar proposal two years later to allow small farm animals such as pigs and goats on lots of less than 2000m<sup>2</sup> drew the following response from the same councillor:

*'Do we want to turn the city into a third world country? We'll turn the city into a zoo. We have zoning for a reason. (Gold Coast Bulletin, 21 August 2012, accessed online 16 October 2012, [http://www.goldcoast.com.au/article/2012/08/21/437011\\_gold-coast-news.html](http://www.goldcoast.com.au/article/2012/08/21/437011_gold-coast-news.html))*

Thus, a somewhat abstract belief that cities (including their suburbs) are no place for chickens, results in a specific local law that proscribes the minimum lot size if one is to keep chickens, pigs or other 'farm' animals.

While the regulations driven by public health concerns are typically implemented and enforced by local government officials, probably the most influential regulators of urban agriculture have been planners (whether called urban planners, town planners, environmental planners or city planners). Of course, debates about the relationship between planning and food security are not new. Peter Self's influential book, *Cities in Flood* (1957) devoted a chapter to 'food versus homes' and to a critique of British

planning policy at that time which sought to preserve agricultural land seemingly at any cost, in the name of food security. While 'atomic war' rather than climate change was the greatest existential threat of the time, he drew on recent wartime experience to imagine that in times of emergency and threatened starvation:

*... every inch of garden would be tilled, playing fields would be ploughed up, road verges would be cultivated. But under conditions in which food distribution – to put it mildly – might be interrupted, families would perhaps prefer to have a little fresh food on their doorstep than to rely on getting it from some 'optimum' place of production. (Self, 1957:114–115)*

He noted also the intimate connections between planning and food, captured in post-war British Labour government's declaration that:

*... to safeguard agricultural land to the greatest possible extent is one of the Department's (of Town and Country Planning) main objects and on taking office, the Conservative Government still more emphatically gave the same aims as **the principal reason for continuing planning controls.**' (p. 107, emphasis added).*

In both the developed and developing world, urban planners have for many years treated agricultural activities as something at the very least to be regulated and in some cases to be positively discouraged in urban and even suburban areas. As Morgan (2009:344) notes:

*Paradoxically, urban planners in Africa have been part of the problem of food insecurity because, until recently, they saw it as their professional duty to rid the city of urban agriculture. The rationale for ridding the city of urban farmers and street food vendors varied from country to country, but it was often animated by a combination of sound concerns about public health and less than sound notions of urban modernity.*

We might note also that in many cities in the developed world, urban agriculture is sometimes seen as incompatible with contemporary visions of the desirable city, although this is now changing in many contemporary debates about the nature of sustainable, liveable and resilient cities in the face of global challenges such as peak oil and climate change.

Morgan (2009: 341) suggests therefore that:

*... for the foreseeable future, food planning looks set to become an important and legitimate part of the planning agenda in developed and developing countries alike.*

However, as Howe (2003:255) notes, '[scholarly] research has tended to bypass or perhaps even ignore food that is grown within urban areas and the land-use policy implications of such activities.'

In his survey of metropolitan planning authorities in the UK, he found that almost half of the responding planners described their awareness of issues of food production in urban areas to be low, while the ways in which these issues were incorporated into land use plans focused typically on the environmental, rather than the social or

economic aspects, of urban agriculture. This suggests that the wide range of activities existing under the broad heading of urban agriculture tend to be seen, by the planning system at least, as a somewhat marginal activity rather than sitting '... right at the heart of debates concerning the sustainable city and those related to urban containment versus expansionism' (Howe, 2003:257).

In Queensland, the first State Planning Policy published in 2012 related to the 'protection of Queensland's Strategic Cropping Land', although for the purposes of this review it is worth noting that this policy does not apply to any strategic cropping land in an urban area or within the urban footprint. Further relevant policies of state and local governments in Queensland and Victoria are described in the following section.

While local regulations that originated in earlier times and epochs of cities may now serve to inhibit the growth of urban agriculture, in some countries more supportive policy environments for urban agriculture are emerging as part of food security initiatives which integrate national, regional (state or provincial), and local government programs.

In Canada, cities as well as provinces are developing food security plans which recognise the contribution that local food systems can make. In their *Metcalf Food Solutions* paper, Nasr et al. (2010) describe the infrastructure needed to scale up urban agriculture in Toronto and identify five areas of action:

- increasing urban growers access to spaces for production;
- putting in place physical resources to support production;
- strengthening the local supply chain;
- sharing knowledge;
- creating new models of governance which will help attract investment finance.

It is worth noting their conclusion that the supply of land is not a barrier to the expansion of urban agriculture in Toronto, given the existence of undeveloped land, vacant land capable of temporary use and the unexploited potential of rooftops.

In Brazil, the city of Belo Horizonte in the state of Minas Gerais has succeeded in establishing a series of world renowned local initiatives to 'beat hunger', including sale of locally produced food in local markets at subsidised prices. However, one of the key points identified in the success of this work is the alignment of local and national goals. As Ladner (2011:241) puts it:

*... they could not have done it without the backing of their federal Plan Against Hunger. The Plan aligned federal departments around food under the National Council on Food Security. The city took the same approach, centralising all decisions about food security and making it a priority'.*

In summary, the literature suggests a number of barriers to expanding the scope and impact of urban agriculture in Australian cities. Perhaps the most significant is the foundational assumption that shapes largely the perceptions of many that cities are not proper places for production of food on anything except a minor domestic scale. Despite an extensive history of urban and peri-urban agriculture, in about two

generations this history has been forgotten by many city dwellers. Although there are clear signs of a resurgence of interest in local food growing, there remains a degree of antipathy to its expansion in some quarters.

Associated with this antipathy but also with important concerns about the public health aspects of urban food production, there is a regulatory regime that in many Australian cities that does little to encourage urban agriculture. Even though such discouragement may not have been the original intent of such regimes, they can in practice work this way. More general attempts to de-regulate may be beneficial but these are more likely to be effective if carried out as part of broader programs to promote greater food security. This third area holds some potential as there is a growing number of cities around the world that are developing systematic and strategic food security programs, most of which include the promotion of urban agriculture in their repertoire of policy measures.

## ***4.2 Results from case study fieldwork***

The themes used to structure the literature review were explored in more detail in two case study locations, Melbourne and the Gold Coast. Drawing primarily on data from interviews with a range of local key informants, this section draws also on relevant policy documents relating to each area.

### ***4.2.1 What do we mean by food security?***

The research undertaken for these case studies has revealed that the diverging perceptions of food security are very noticeable in Melbourne and the Gold Coast. The prevailing view at the national and state government levels appears to be that Australia is food secure because it exports a substantial surplus (roughly two-thirds) of its agricultural production. From this perspective, the challenge of global food security is reframed as an opportunity for Australian agri-business and manufacturing sectors, to become, as the Prime Minister put it recently, the 'food bowl of Asia'. This view was echoed by the Victorian Government's Minister for Agriculture and Food Security, Peter Walsh, who in May 2012 called on the state's farmers to double food production by 2030 in order to meet 'growing global demand for food and fibre'. Similarly, the Federal Minister for Trade and Competitiveness, The Hon Dr Craig Emerson, argued recently at a conference on the future of Australia's mid-sized cities, that their future lay in being part of a greatly expanding agriculture and food processing industry that would meet the growing demands of the Indian and Chinese middle classes. In this framing, domestic food security – at the regional, state and national level, is simply taken for granted, irrespective of climate change and any other challenges such as Peak Oil or global economic turbulence. This view is clear also in the recently published Australian Government Green Paper, *Towards a National Food Plan for Australia* (Australian Government, 2012).

This attitude of complacency regarding domestic food security appears to include, within parts of both the Victorian and Queensland governments, open contempt for ideas and practices associated with 'local' food, including urban agriculture. This was made clear to the research team by individuals with detailed knowledge of recent changes in the Victorian Department of Primary Industries (DPI):



*[There] is a growing group of traditional economists sitting within the research arms of DPI, orthodox, economic rationalists. They have a lot of power [and] have been responsible for poo-pooing concepts like food miles, or small farms versus big farms ... They've no interest in urban agriculture, and are going out of their way to actively disparage it. Any food growing that's not large-scale, commercial production oriented to export, is [for them] largely a waste of time.*

For them, the unit of analysis is a farm; and they have to define in some way what the average size of a farm is, and they extrapolate up to the state level.

*You can draw the consequences of such an approach, from an environmental [and climate change] perspective. It's a very biased and partial analysis. That notion of extrapolating from farm up to state level is the most problematic for [work] in the climate change space, [where the focus] is on [bio-]regional issues. [state government scientist]*

This attitude of open hostility by senior DPI staff towards individuals and organisations working for what might be termed a 'sustainable and resilient' food system based on support for urban and peri-urban agriculture was also mentioned by other Victorian State Government employees with whom we spoke.

Conversely, and as mentioned above, the semi-autonomous state government agency VicHealth has been a prime institutional driver for mainstreaming food security at the policy and project level at local government. VicHealth made a major strategic intervention in this field with the launch in 2005 of a five-year, multi-million dollar project entitled Food for All. In the design of that project, VicHealth deliberately chose to adopt the FAO's definition of food security, with the added element that individuals should not have to depend on emergency food sources in order to gain access to adequate amounts of food. As one of the managers associated with the Food for All project told us:

From the VicHealth perspective, food security is more about inclusiveness, social connectedness. The understanding is of having secure access for all to adequate amounts of culturally appropriate and safe food, and not from emergency sources.

*Regular food to stay well, good quality food, from regular sources, not from food banks and soup kitchens. [Former manager, VicHealth]*

Nine local governments were funded to recruit food security officers as part of the five-year, Food for All project. One of the explicit objectives of that project was to achieve integrated planning within councils and across their various departments; and it was envisaged that a first step towards that goal was to integrate food security into local government policy documents. A positive outcome of the project was that the participating councils all incorporated, most for the first time, food security into their most recent (2009–2013) Municipal Public Health Plans (which some Councils also now describe as Municipal Public Health and Well-being Plans). The project evaluation also reported that the most recent plans reflected:

*a shift from healthy eating and nutrition in the earlier plans to food access, food affordability and food security in the later plans;*

and;

*a stronger focus on addressing the factors that underlie food security, such as healthy urban planning, and access to employment, affordable housing and planning.*

Furthermore, a number of the participating councils were also incorporating, for the first time, food supply and food security issues into their Municipal Strategic Statements. In addition, food security and related issues had been incorporated by 2010, into 21 plans across community services divisions in the various councils, and in 20 plans developed in infrastructure divisions.

There has been less concerted action around local or municipal food security in Queensland where, again, agriculture is seen primarily as a rural activity, albeit one of the 'four pillars' of the state's economy identified by the Newman government. There is little evidence that food security is seen as a pressing issue facing cities within the state, although there has been (until recently) some policy attention given to the potential for greater food production in urban and peri-urban settings.

Gold Coast City Council did, however, identify local food production as an important element in its climate change adaptation strategy and commissioned a scoping study of local food production and purchase (GCCC, 2011). This included urban food security in a more holistic manner and recognises the environmental, economic and social benefits of developing a more integrated and extensive local food system.

On the Gold Coast, food security has been explored at the individual level, with an increased emphasis on food production and sharing initiatives:

*Food security is not having to go down to the shop and buy your own. It's about growing your own, and so in terms of food security for people it cuts down on food miles and that's a good thing. But it's really not generating much in the way of people's food security, if they come here and buy stuff all the time. We've got people who come here and they've looked at us and again some of the unemployed people, like that guy I was just talking about who's now employed full-time. He lives in a boarding house and he's got this massive food garden in the back of a boarding house and so he's cooking with gas. Another guy, an artist who paints our beehives – we've got two artists – and he's all fired up and he's taken water weed and you name it home to build his own garden. I guess it's good in a way here that it provides security for people to have an alternative form, like an alternative production area for food so that if something goes wrong somewhere else, then okay, there's always there's food here. They could come here instead of going to the supermarket but yeah, I'd really like to see more people growing their own stuff [Market gardener and permaculturalist, Gold Coast].*

This notion of food resilience also resonates quite strongly with community and individual urban agricultural practitioners interviewed during these case studies. Many of these interviewees expressed their understanding of food security in terms of greater levels of individual and community self-sufficiency. They talked about 'people growing their own food'; and activities such as food sharing and food swaps (mainly of produce grown in backyards), seed sharing, and plant exchanges. Angelo Eliades, whose

backyard food forest, discussed in more detail below, spoke on behalf of himself and his fellow local permaculturalists in Melbourne in saying:

*Our focus is about people producing their own food. We're about food security as growing food to keep people alive, not food security as producing food as a commodity for a consumerist society. [Food is] not a means of making money, it's a means of keeping people alive. Our focus isn't on yields and produce, at the cost of quality. Our focus is to produce yields and big harvests with the highest of quality. We're aiming at food that has high nutritional value, and long-term has benefits in terms of reducing government outlays on health.*

Another interviewee, from a social enterprise, alluded directly to the principles of permaculture in her conception of food security:

*It's all very much a part of consciously living in a far more environmentally sustainable way, which takes into consideration environmental justice and social justice. It is about looking after the needs of people – the permaculture principles, care of people, care of earth, share of surplus – they're kind of basic, but they work [Manager, social enterprise].*

A clear example of the perceived benefits of self-reliance and becoming individually more food secure is presented by an organic grower and activist from the Gold Coast. Her experiences with the Brisbane floods were both dramatic and enriching:

*Well, for instance when we had the floods and people couldn't get milk everyone went nuts because they couldn't get milk for what was it a day or two? And then the price of vegetables when through the roof. Well, yeah, those kinds of floods affected us too and you know some of the stuff in our garden fell over and died as well but there were things there that we wouldn't have starved, we might have got a little bit hungry and baked beans might have been on the menu for a few nights, but it would have been with some salad and parsley and grind up a green paw-paw for a nice Thai green paw-paw salad, you wouldn't have just survived, you could have lived [Non-government organisation employee, Gold Coast].*

Adding another dimension to the debate, academic researchers were especially concerned about the issues of environmental sustainability, intergenerational equity, climate change, resource resilience, and fairness. One offered this multi-dimensional conceptualisation of food security:

*Food security is sufficient, equitably accessible and sustainable food. Sustainability in this context means food produced in such a way that doesn't undermine the ability of future generations to meet their own food needs. That's really important, and isn't talked about enough, especially in relation to water and land issues, on the peri-urban fringe.*

*Secondly, that we're meeting food needs into the future, taking into account the conditions we're likely to face into the future. That's to say, oil, land and water all becoming more scarce, and the price of oil becoming more expensive. And the climate change implications that I believe we're going to face, and that we're already starting to see ...*

*The third key aspect is fairness – that we're producing food in such a way that it's viable for farmers to stay on the land, and continue producing that food. Fairness doesn't often come into the definition of food security, but if you want long-term food security and a resilient system, then you actually need to be paying people to stay on the land. There's so many farmers leaving the land at the moment, that's a real issue, and should be seen as a really core element of food security [Academic researcher].*

Academic researchers we spoke to were especially concerned about the issues of environmental sustainability, climate and resource resilience, and fairness. One experienced academic offered this multi-dimensional conceptualisation:

*Food security is about sufficient, equitably accessible and sustainable food. Sustainability in this context means food produced in such a way that doesn't undermine the ability of future generations to meet their own food needs. That's really important, and isn't talked about enough, especially in relation to water and land issues, on the peri-urban fringe ...*

*The third key aspect is fairness – that we're producing food in such a way that it's viable for farmers to stay on the land, and continue producing that food. And we're not currently doing that [Academic researcher].*

Similar comments about conventional definitions of food security were made by others in the community sector that might be regarded as part of the broader 'fair food movement'. One commented that 'food security sounds very official, and a lot of people don't relate to that'. Another said 'food security can put some people off – people understand growing your own, being healthy, being sustainable, and that's the sort of language we use'.

One of the backyard gardeners and community food activists with whom we spoke highlighted the concepts of control and self-sufficiency in her understanding of food security:

*[Food security] means having control over my own food, knowing I'm going to have continued access to it. Self-sufficiency is not quite my aim. I want to provide for as much of my own needs as I can, but I don't think total self-sufficiency is a realistic objective. Our aim is not to have buy any fruit and vegetables during the summer and autumn [Permaculturalist and backyard gardener].*

#### **4.2.2 How is food security likely to be impacted by climate change?**

Amongst the small sample of commercial farmers and growers we spoke with, there was generally a degree of scepticism about the empirical reality of anthropogenic climate change. This appears to be reflected also in the current Victorian and Queensland administrations, with interviewees reporting a strong strain of climate scepticism and even denial amongst leading politicians. By contrast, urban agricultural practitioners and researchers with whom we spoke firmly believed that climate change would affect food production in Victoria, especially in the northern food bowl region of the Murray Darling Basin. We were not able to speak with as many similar practitioners in Queensland.

The research revealed that there is, as expected, a mixed reaction towards the existence and the impacts of climate on food security (or food production) in Australia. Ranging from politicians, to commercial farmers to hobby gardeners, climate change scepticism and even denialism was evident. One of the most concerning revelations was the perceived lack of concern about climate change among some politicians:

*In their [politicians] worldview, climate variability, resource constraints, land use conflicts, none of that figures into their calculations. In general, they are climate change deniers. Climate change is an economic problem ... [and] now we're basically not talking about it at all, it's fallen to the wayside...to the point that they have even cut the climate change unit in DPC ... [but] this wave of denialism, and anti-science, is not unique in Victoria, it's across Australia [State Government Employee].*

The recently elected Mayor of the Gold Coast, whilst not rejecting scientific evidence about climate change, has been reported recently as saying that it is simply too far away in time for him to be concerned about sea level rise:

*I don't intend to use our ratepayers' funds for something that is going to happen in 90 years. It may or may not be wiped out ... I live on the water and what may happen to my house in 90 years is not my concern. (Gold Coast Bulletin, 27/9/12)*

Many commercial and hobby farmers expressed their disregard for climate change, often suggesting that this was a natural event. For example, an older dairy farmer from the Mornington Peninsula, who began farming in 1973, expressed his disdain towards climate change:

*The climate's been changing for millennia. I don't think there's anything that's happening now that's out of the ordinary. We've had droughts before. We've had rain before. We've had wet years before, and similar patterns to the last 10–15 years ... In geological terms, we're pissing in the wind. Nobody wants to hear that. It's good going and planting trees and all that, but the environment, where I grew up, is so different now to when I was a kid [Dairy Farmer, Melbourne].*

A major commercial horticulturalist from the same region, whose family had been growing for a number of generations, shared his scepticism and disdain towards the very proposition that anthropogenic climate change existed as a phenomenon, albeit in a somewhat contradictory manner:

*Climate change is all bullshit, people just jumping on the bandwagon. Nature has to take its course, we can't stop it, we can't control nature. There was ten years of drought in Clyde, but now the weather's changed again. There are sometimes early springs, and early summers. If that happens, we adapt, we do the best we can. We sense the changes. The early springs and summers mean that it will be hot and muggy and wet [Market Gardener, Melbourne].*

Furthermore, a small-scale market gardener from the Cardinia region in Victoria explains that even though the science of climate change have advanced and 'proven' the phenomenon, he has not seen any difference to his farming:

*Nothing has really changed for us in the 30 odd years that we have been gardening, including the climate, it changes with the seasons. So perhaps the*

*climate (which we live and work in 24/7) is what we adapt to on a daily and weekly basis. We don't think oh... in 10 odd years it will be warmer or cooler so we better plant this now! This is a controversial question assuming that climate change is proven factor and difficult to answer. We adapt and deal with it daily. [Market Gardener, Melbourne]*

In comparison, subsistence and hobby growers have expressed their concern towards climate change, pointing out that there seem to be a lack of understanding and even some narrow mindedness about the topic.

*Well you know I come to this from a strong sustainability perspective but not everyone does. I'd probably say few people probably do, who are getting involved in community gardens and so, you know, people linking a community garden with climate change as a mitigation strategy is probably few but I think it takes people like myself [and others] talking about it within the group and we'll do workshops and that sort of thing and that'll hopefully broaden people's perspective of their ability to affect climate change [Community Gardener and Permaculturalist, Gold Coast].*

Lack of data, information and local modelling were also suggested as a deterrent to understanding and adapting to climate change:

*I am really concerned about it [climate change]. I mean deeply concerned. And yeah I think we have got to stop just sticking our head in the sand and start really having a good look around and preparing and looking at data and research so we can factor that into our preparations and here I don't know I would really like to be able to get hold of some sort of forecasting information about what they think the [Gold] Coast is going look like. Will it get wetter? Will it get dryer? Obviously there are weather fluctuations [from] climate change or not, so this idea that things that are dry, [are] they are going to be dryer? If they are wet are they going to be wetter? If cyclones are going to be bigger, more of them and sooner, longer, that kind of thing you kind of want to factor that in. [Non-Government Organisation, Gold Coast]*

Despite this apparent scepticism or lack of knowledge about climate change and its impacts on food security, numerous concerns were raised. Concerns about increased drought, higher temperatures, water shortages, extreme events such as hail storms, sudden temperature fluctuations, shorter summers, and milder winters were raised by many interviewees.

An experienced backyard gardener and life-long Melbourne resident, commented that the 'real warm springs and damp summers' are a 'drastic change' which had impacted both backyard gardeners like himself and commercial producers in and around Melbourne:

*The weather changes are a real concern, we've seen a progressive decline in the weather, and I've had to change my strategies about how I grow [my plants], how I prune [my trees] so they get more air circulation, putting them in warmer spots so they dry more quickly ... Now what we're getting is much shorter summers and sudden fluctuations in spring [Backyard Gardener and Permaculturalist, Melbourne].*

This gardener also commented on the milder winters, which seem to many to be another trend for Melbourne:

*It didn't get cold enough for a lot of plants to die down, so that asparagus, which should die down in winter, and produce new spears in the spring, it didn't do that, it was far too mild. We had some fruit trees flower for a second time, which they don't normally do, because it stayed warm into late autumn ... [The mild winters are] a real worry, [especially for commercial growers]. A lot of fruit requires a certain chill temperature, so they can produce in the spring. Because our winters are getting milder, we might not get enough chill period for the apples to produce properly [Backyard Gardener and Permaculturalist, Melbourne].*

The disturbed water cycle was also a talking point on the Gold Coast, especially after the 2010–2011 floods. A well-established organic farming couple, with over 15 years' experience farming on Mount Tamborine, in the Gold Coast hinterland, explained how the changes in rainfall patterns and volumes has affected them in the past few years:

*Talking about weather, you were talking about climate change and that, we've had two of the worst years in 16 years you know, last year it was the floods where whilst it didn't flood on the mountain it was three months of persistent rain and no sun and we got to a stage where by March, for the first time, we didn't have anything to pick, you know it was so waterlogged, and because there hadn't been any sun, nothing was growing – if you put a seed in, it wouldn't grow [Farmers, Gold Coast].*

Another interviewee in Melbourne commented that water restrictions made backyard and community gardening difficult, especially for those who did not have rainwater capture and storage tanks:

*In the drought, when we were on 3 and 3A water restrictions, there was no accommodating people who wanted to grow their own food ... You had to apply for exemptions. Some schools got exemptions, to keep watering their school gardens. But that wasn't available to households [Academic Researcher, Melbourne].*

Water security emerged from this research as a major consideration when thinking of the nexus between urban agriculture, urban food security, climate change and urban resilience. However, as pointed out by one of the participants, there is a certain irony to the prevailing system of water allocations and restrictions, and how this is perceived by the wider community:

*Supposedly we've got a water shortage, and we've got people growing citrus orchards that are very unsustainable water-wise, and we're doing it in semi-arid, half-desert environments. We're growing sugar cane, which uses massive quantities of water, in really dry areas. These growers are getting subsidised water: cotton is terrible, sugar-cane is worse [in terms of water usage]. We're also growing semi-aquatic rice, in the driest parts of Australia ... There has been a lot of complaints by gardening groups, and calls for the government to give people in urban environments incentives to grow their own food, by giving them water at the same rate that the farmers get it. We're being charged a fortune for water here, but the irony is that 80 percent of all water usage is in [commercial]*

*agriculture. Eight percent is in urban environments, twelve percent is industry. So while people are putting their toilets on half-flush and things like that, if you were to nuke all the urban centres and populations of Australia, you would only save yourself eight per cent of the water, which is really quite insignificant in the larger scale of things [Backyard Gardener and Permaculturalist, Melbourne].*

Climate change is however seen not only as a concern but also as an opportunity. For example, one of the commercial farmers we spoke with specialising in hydroponic production – saw their business as being significantly impacted by climate change, but in a positive way:

*With the igloos, we can control the temperature ... So next year, we do want the heavy rain, we do want the crazy weather, because we know that the other farmers who use the traditional growing methods will struggle with that, and we won't. So climate changes actually work in our favour, the bad weather outside will cause production difficulties for other producers [but not for us]. For us, climate change is a market opportunity [Hydroponic Market Gardener, Melbourne].*

Similarly, but on a different scale, climate change did not seem to be a cause for fear in Queensland. A micro farmer on the Gold Coast suggested that small scale, diverse and local production might hold the key to food production under climate change scenarios, especially through the application of organic growing methods. This micro farmer explained that climate change was unlikely to affect his crops because of his emphasis on organic gardening techniques:

*I think more along the lines of what we're doing here is not [destructive], it's more regenerative than taking out of the system... We make all our own soils. It's the soils that are the focus. Okay we use a fair bit of water I suppose, but the water use, because of the way we make the beds, the beds hold moisture really, really well and we're having a lot of organic matter in beds. We plant so that by the time the plants get up basically the whole bed's covered anyway. If you look at those beds out there, most of them are pretty close together and the soils not really exposed at all, so from a moisture perspective and from a rain perspective, climate change will not affect us [Micro-Farmer, Gold Coast].*

A founding member of Gold Coast Permaculture explained that even if climate change affected his micro-farm, if there is a de-centralised system of small scale micro farms across the region, climate change would not be a problem:

*This sort of stuff here [Gold Coast Permaculture] addresses a lot of climate change issues. But there is just no way that we can live long like this, and there is nothing we can do to come back from the point that we are at. It does not mean that we should just burn everything you know, and just keep going I just think that, if we build more resilient localised systems, more diverse systems, the more diverse, the more local, the more resilient, the better. If I have a garden here and it gets wiped out by climate change, my hope is that, there are five or ten gardens in other urban areas that will miss that and they can plant another crop or whatever. I mean sure it is nice to eat the food that we want to eat, but if it comes*



*down to a food scarcity situation we are going to eat what we are given [Micro-Farmer, Gold Coast].*

Similarly, a backyard gardener from Melbourne expressed his vision of an expanding network of climate-adapted and resilient food forests through urban backyards, and outwards into suburban parks:

*What I've realised is that the next step beyond an individual's isolated food forest is to have many of these linked up. To have a sense of community where people share their produce. They all grow different produce, and share it between themselves. That evens out any sort of fluctuations in species, weather, climate conditions and everything else. It creates a more resilient production system [Backyard Gardener and Permaculturalist, Melbourne].*

#### **4.2.3 What do we mean by urban agriculture?**

The general conceptions of urban agriculture offered by interviewees were broad and inclusive. They included the following:

- anything that's produced in the city, and used by and for the city [Independent researcher]
- putting productive plants in the community [Local food activist and backyard gardener]
- agriculture and gardens producing within urban barriers, including peri-urban zones. It's not necessarily commercial, it would include backyard production. [Senior academic researcher]

City of Yarra Urban Agriculture Officer, Pete Huff, brings a valuable cross-cultural understanding and experience to these issues, having worked as a small scale commercial market gardener in the Bay Area of San Francisco and being familiar with the burgeoning local food and urban agriculture movement in the United States. He offered the following thoughts on what urban agriculture is, highlighting the historical continuities between what's happening now in terms of food production in cities, with earlier practices:

*It's opening up the spaces 'in-between' ... there's quite a bit of land that can be accessed in the urban setting, and could be developed into something productive. It will take some alternative methods of cultivation, some very resilient farmers that are able to adapt and move between those strips of land. But in my mind that's what it's all about – opening up what has previously been considered to be collateral damage of urban development. That's roof-top spaces, that's nature strips, that's edges of parklands – places that can be productively farmed, and have immediate access to the market, while providing job training and employment opportunities for people in the inner city. And I think really restoring that – every city has a history of urban agriculture where glasshouses or greenhouses existed, or bio-intensive production happened, animals were kept. It's not something new, though we treat as though it is ... It's just that we've forgotten the power of those in-between spaces to produce quite a bit of food [City of Yarra Urban Agriculture Officer].*

This concept of the 'spaces in between' is valuable in terms of thinking about the potential for urban agriculture to expand in Australian cities and urban centres. The work of Permaculture Gold Coast on a small private site in Ferry Road, Southport, is one example of what can be achieved by creative individuals and community groups working in partnership with their local councils.

One academic researcher pointed out that urban agriculture means different things in different cultural and geographical contexts, with a particular distinction between the global North and the South, and between countries in the former:

*It means different things in developing countries. In Australia, it's backyard and community gardens, and perhaps peri-urban market gardens. Here [in the inner city] it's generally not commercial-scale, as in US spin farming, which can be done on little blocks of land. In countries like Ghana there are stronger economic drivers, and lighter regulation – for example, they use raw sewage to grow food, which obviously creates a transfer of pathogens. Conversely there are benefits with the higher nutrient content of the water [Academic researcher].*

Others looked to initiatives and approaches in some Southern countries and saw valuable lessons and sources of inspiration for what might be possible in Australia:

*The model we like is Havana [Cuba], and we ask ourselves how it could be replicated here. They achieved a 1000% increase in productivity per unit over an 11-year period with key factors including intensive research into bio-fungicides, bio-insecticides and integrated pest management, together with the wide diffusion and accessibility of that knowledge. The pro-huerta movement in Argentina has also achieved impressive results in urban food production [Academic researcher].*

Another academic researcher, who had conducted a number of forums with farmers and market gardeners on Melbourne's peri-urban zones, commented on their somewhat disparaging perceptions of activities typically regarded in Australia as urban agriculture, such as community gardening:

*[Some] farmers think it's naïve, one comment after a forum was, 'They think we can all grow tomatoes in pots on the balcony, and that there'll be enough food'. So there's a perception [amongst farmers] that urban agriculture is just small-scale food growing in the city, that's it not commercial, that's it not going to make any contribution to food supply. I think we should be seeing [urban agriculture] more broadly, that we should include what's on the fringe as well ... agriculture that takes place on the urban boundary. That would include areas of quite significant food production; and the same would apply to the fringe areas of satellite cities. [For Melbourne] I'd include Casey-Cardinia, and Werribee, Bacchus Marsh, Yarra Valley. If we're talking about agriculture, it's more than pottering around in community gardens. So we have to include peri-urban agriculture – where agriculture meets the city, and all those issues on the fringe of the city, those tensions [Academic researcher].*

It was suggested that the terminology of 'urban agriculture' might not be appropriate to describe non-commercial activities such as backyard and community gardening; and whether instead the term 'urban gardening' might be a better description of such activities. Such a distinction has however not been made in the literature; and we

believe, having regard to the diversity of innovative practices that urban agriculture is now recognised as including, that it makes little policy or practical sense to introduce it in the Australian context. This does not of course prevent councils and policy-makers being cognisant of the different functions and roles of non-commercial community gardening, and commercial-scale urban food production in a city or peri-urban market garden.

#### **4.2.4 How might urban agriculture contribute to greater food security?**

When asked to explain what they understood by resilience in the urban context, many participants in both case study areas used terms such as 'adaptability', 'flexibility', 'preparedness', 'confidence', and 'increased skills'. Those working in community groups spoke of 'social resilience' and 'connectedness', expressed through 'sharing and doing', 'networking', 're-skilling' and 'enhancing capabilities'. Based on their own experience and practice, these participants were passionate believers in the creative and adaptive power of people working together in pursuit of a shared goal and vision:

*When you create space for people to come together, amazing things can happen ... Council could encourage neighbours to steward a street ... This has serious potential! [Community food advocate]*

Another community food activist, who had participated in a number of permablitzes commented:

*There's an average of forty people at each blitz, many with only entry-level knowledge about food growing, and most of whom don't know each other. It's shocking how well people work together. In each blitz there is some problem-solving involved, and inevitably the design alters through discussion [Community food activist and social entrepreneur].*

While another proposed a broader, community- and systems-based understanding of resilience:

*Resilience for me is the ability to decentralise systems. I see resilience as an evolution in action, creating opportunities for people to be actively engaging in a practice, growing food or whatnot, in a very localised sense, that allows them to evolve the most appropriate systems for their particular needs, and their particular time. And I think it's something that needs to be inspired, because people will naturally do it.*

*That will create a diversity of solutions ... I see that as resiliency around food: people growing their own food locally, in their own neighbourhood, are like little life-rafts, little support networks, that are forming around growing and producing food; but more importantly, getting out of their houses, and co-living, sharing the burdens of life in a city, and life in general, in a neighbourhood. Which is something that I know existed before. It hasn't existed in my lifetime, or at least in my experience, but it's something that I see as that true resilience. When times become difficult, people rather than go internally, come out [City of Yarra Urban agriculture officer].*

The researchers with whom we spoke tended to understand resilience from the perspective of social-ecological systems thinking, as seen for example in the writings of

research scientist and chair of the Resilience Alliance, Brian Lake, who defines resilience in terms of 'the capacity of a system to undergo change and still retain its basic function and structure'. In this school of thought, a resilient system is seen to include features such as:

- ecological, social and economic diversity;
- tight feedback loops;
- working with natural cycles;
- 'well-developed social networks and leadership', and high levels of trust;
- an emphasis on 'learning, experimentation, locally-developed rules and embracing change';
- 'institutions that include redundancy in their governance structures and a mix of common and private property with overlapping access rights'.

Incorporating this thinking into conceptualising a resilient food system as one that is capable of adapting to a changing climate whilst achieving future food security, one researcher described such a system as one that is:

*Flexible, adaptable, and can respond to whatever happens in the future in terms of a changing climate, extreme weather events, and the price of oil going through the roof. We can make predictions about what's going to happen and when, but we don't know, and in what combinations. So there are some things that just seem fairly sensible to do, because a number of these things might happen. [Doing those things] means that we're more likely to be able to get fresh, reasonably affordable food to people, when they need it.*

*So resilience is about planning and preparedness for a number of different scenarios that may happen in the future, as well as the resilience in ensuring that a farmer is able to keep farming the land. There's no point protecting land and water sources, if we're not paying farmers enough to keep farming on the land – there has to be fairness for farmers.*

*It's not helpful to think about the climate change issue separately from all the other emerging issues. We need to plan for a system that's more resilient to all of them. And if you think about it that way, then there's real synergies between the steps that need to be taken to address climate change, and the steps that need to be taken to cope with oil price volatility, and the steps that need to be taken to ensure fairness for farmers [Academic researcher].*

VEIL's Future Scenarios work, discussed above, clearly fits into this systems approach of 'planning and preparedness' for an uncertain future. In Melbourne's urban agriculture and community food movement, there is a strong current of opinion that is informed by the view that the current globalised food system, because of its heavy dependence on fossil fuel inputs, and its high ecological footprint, is fundamentally non-resilient and vulnerable to some sort of systemic breakdown or even collapse. This is evident in statements such as the following:

*The industrialised food system is the main cause [of current and future food insecurity]. It's the most destructive force on the planet. It is a major driver of climate change, generating up to 33% of all GHG emissions, and as much as*

*50% of humanity's total eco-footprint. It leads to soil degradation and erosion, it pollutes waterways, it creates dead zones in the oceans, and it is highly energy intensive ... A resilient food system [on the other hand] means being able to keep going when the lights go off, being able to deal with radically less energy [Community food activist].*

and;

*The Garnaut report said that by 2100, 90% of irrigation agriculture in Australia will become unviable. Are people not thinking about what that means? To really understand this is a massive change. We're running out of cheap oil, and we have climate change, it seems crazy that we would [just] rely on [large-scale systems that seem likely to break down] – [Backyard gardener and permaculturalist].*

and;

*With Peak Oil, the viability of transporting large amounts of food long distances diminishes. With climate change, it looks like farmers are struggling already, and their production methods are unsustainable. They've got two things working against them: the climate's getting less supportive of their activities, and their activities are unsustainable to begin with ... especially in terms of water shortages. It's all looking rather shaky. In fact, it's looking like we can't depend on our rural sector to provide us with all our food ... We're pretty well gearing up for the worst in the climate; and the worst-case scenario in the rural sector. And frankly – I hate to say this – the food that's coming out of there is crap anyway, because of all the commercial pressures from the supermarkets on them to keep dropping their prices. So they have to use as many short-cuts as they can to stay afloat ... I did some research and found out that, compared to 20 years ago, an apple today has only 25% of the nutrient value it did back then, because it's picked unripe, stored in a fridge for months, then chemically ripened. That's really, really scary ... So [those are the reasons] why we're looking to [urban] public land as the [future] basis of resilient food sources [Permaculturalist and food forest advocate].*

A resilient food system, on the other hand, will, according to most interviewees, have a number of features that will enable it to cope with a variety of external and systemic shocks (including climate change and Peak Oil); and also be capable of delivering fairness and social justice, for farmers and consumers. Terms such as 'waste minimisation', 'import-dependence minimisation', greater levels of 'food self-reliance and self-sufficiency', eradicating the need for emergency food relief, and creating localised and sustainable supply systems were all mentioned on a number of occasions:

*A resilient food system would work from food production, to consumption, retail and waste, and how we deal with that. A functioning, coherent system, that provides well for everybody in the population [Manager, non-government organisation].*

As discussed above, protection of the prime farmland on the peri-urban fringes of Melbourne and the Gold Coast was seen as essential by many if these cities are to have a sustainable and resilient food system:

*[this land] can guarantee a permanent food supply to Melbourne. The soil is among the best in the state, which is why you can crop on it three-four times a year. There's the existing investment in infrastructure, in recycled water. This land is a strategic economic resource for the future, akin to mining. And there's the primary value of the product itself, but there's a major opportunity for value-adding – what about canneries? What about food technology? [Senior local government manager]*

Integrated planning frameworks which address the issues raised above and protect peri-urban farmland were also mentioned:

*A resilient food system also means looking at retail and food service, so the outlets for food are accessible to people, are in the right locations, that they are affordable and provide a good mix of healthy options. It also means including the food service industry, which means tackling the whole question of fast food outlets [Manager, non-government organisation].*

In terms of moving to a more resilient and sustainable food system, the issue of shifting norms was an emerging theme. This was coupled with the belief that the greater visibility of food growing – the vision of an 'eco-city' with an abundance of food growing in all the 'spaces in-between', as in Havana, could in turn be a means of creating a viable future for local farmers growing for urban markets, and of enhancing local economic diversity:

*You think of people from all different walks of life, being much more connected to food; there would be a higher demand on your core healthy foods, if you're surrounded by fruit and veg – it would be more common, more visible. Creating that connection, from food back to people's lives, seeing plants grow up around us – it would create interest, and demand for healthy foods. And the multicultural dimension – the duopoly don't offer that much variety, the urban environment can offer more diverse, culturally-attuned ingredients [Manager, non-government organisation].*

Urban agriculture was seen by many interviewees as having a key role to play in building greater levels of urban resilience in general, and of resilience to climate change in particular. A common view is that the re-localisation of food systems which urban agriculture embodies will be an important element of adaptation, together with a greater sense of collective responsibility for the design of climate-ready urban food systems:

*Small and diverse will be the way to go. Food needs to be close to people, they will notice its needs and respond to it. They will understand the necessary adaptations that might be required, such as additional shade. There needs to be greater flexibility, greater understanding of local resources, and the taking of decisions collectively [Urban gardener and local food advocate].*

*Food grown locally won't suffer the impacts of peak oil and climate change [Urban food advocate].*

*The milder winters are becoming an issue, in terms of certain species and varieties that require a certain chill temperature. I've planted three apples, because I like them, but most of the other plants don't depend on that chill factor. We'll see what happens over time, and whether we need to replace them with something that's more appropriate for a Mediterranean climate, if that's what we're going into [Permaculturalist and backyard gardener].*

One of the emerging features of community-level urban agriculture in recent years has been food swaps which can build strong community relationships and networks and play an important role in creating a resilient food system:

*These are key in terms of increasing the variety of local food you can access, especially if you're renting, and you can grow short-term crops and swap them for longer-term crops that you can't grow. The food swaps fill a really critical niche, in terms of a resilient local food system. They are a great social network ... We have fantastic social networks in our community, constantly swapping and gifting produce, I know I can harvest rocket from my friend's house, for example [Permaculturalist and backyard gardener].*

The potential for 'food forests' to form a key building block of resilient food systems was also mentioned especially in terms of their climate-ready design:

*Food Forests let you do a waterwise garden design. Everything's not exposed to the sun and the wind, you get micro-climates, you get natural mulching with the leaf layer, plus we grow cover plants, and mulch plants that die down, it's a sheet-composting system, which traps all the moisture. So we're doing very well, and our plants are much hardier. I've had berries which aren't meant to face full sun, survive 45 degree weather. Whereas in the hydroponic system, which I've got running alongside as an experiment, last year the corn got torched, it couldn't draw water fast enough, it was far too exposed [Permaculturalist and Food Forest advocate].*

At the commercial scale, it was noted above that a number of growers are investing in poly-tunnels and 'igloos' in order to control the external environment and increase their productivity by reducing or eliminating their exposure to diseases, pests and extreme weather events. Hydroponics is at the cutting edge of these modern horticultural technologies, and it appears to offer many benefits over conventional methods of production:

*The biggest thing for us is our hydroponic production – we produce four-to-five times what we would get if we did the traditional method of ploughing the land and planting in the ground. That's why our business has been able to grow so rapidly, because even though it's on a small block, we've been able to produce a fairly large volume of herbs [Young hydroponic grower, Casey-Cardinia region]*

On the other hand an experienced organic producer from the Gold Coast hinterland was sceptical of hydroponic approaches:

*... we don't like hydroponics, the food is cancerous. It's meant to be grown in the soil [but] this is all grown with chemicals. Aquaponics is much better [local organic producer].*

#### 4.2.5 What is the extent and the impacts of urban agriculture in Melbourne and the Gold Coast?

Almost all interviewees mentioned community gardening when asked to state what sorts of activities and practices they would include under the umbrella of urban agriculture, however almost without exception they went on to list a much wider range of activities, which we have summarised as follows:

**Table 1: Activities and practices of urban agriculture**

<b>Aquaponics / hydroponics</b>	<b>Guerrilla gardening</b>
<b>Backyard gardens</b>	Market gardens / peri-urban production
<b>Chicken-keeping and micro-livestock</b>	Restaurant gardens
<b>City farms</b>	School gardens
<b>Community composting</b>	Seed sharing
<b>Community gardens</b>	Street gardening and nature strip planting
<b>Community nurseries and plant exchanges</b>	Tree grafting
<b>Farmers' markets</b>	Urban beehives
<b>Food forests</b>	Urban mushroom farms
<b>Food swaps / exchanges</b>	Urban orchards
<b>Green roofs</b>	Vertical gardens

As this list illustrates, the interviewees, both individually and collectively, had a very inclusive and expansive conception of what urban agriculture is, and what it could become. One expressed a vision of a city overflowing with food in many sites, a sense of sustainable abundance:

*I see it very broadly – community gardens, school gardens, restaurant gardens, market gardens, home gardens, office gardens, rooftop gardens, vertically-integrated agriculture, gardens in aged-care homes, gardens for people with mental health issues, social enterprises incorporating food production – you can go on and on, the sky's the limit. There would be food everywhere – the true 'eco-city' [Manager, social enterprise].*



The Scoping Study for Local Food Production and Purchase (AECOM, 2011) produced for Gold Coast City Council presents a striking vision, 'The Seeds for Change', of how a local food system might develop in the city in the future. This imagines a number of developments that might happen over the next decades that would make the city more food secure, and includes:

- a Gold Coast Farmers' and Growers' Network with a membership of over 300;
- land leased to growers by the Gold Coast Farmland Trust;
- a multi-functional Gold Coast Food Hub located next to one of the new Light Rail stations;
- a network of City Farms located in flood plain areas;
- over thirty weekly Farmers' Markets;
- over 100 Community Gardens;
- vegetable garden in every school;
- aquaculture activities in canals, waterways and lakes.

These visions highlight the multi-functionality of urban agriculture, and in particular its capacity to build community, in addition to any contribution it may make to net food production and thus to urban food security.

Consistent with the expansive visions and inclusive conceptualisations of urban agriculture outlined above, interviewees identified a similarly long list of activities taking place in and around Melbourne and the Gold Coast that would meet this description. As is evident from the above list, while most of the activities fall under the rubric of food growing and production, others take the form of exchanges, such as seed and food swaps.

In addition to production and exchange activities, interviewees also identified educational and policy initiatives they felt worthy of attention in this field. Accordingly, we have developed a simple typology of urban agriculture activities, based on the six food system sectors identified above, plus waste and recycling, education, and policy. This will be further refined in feedback forums with all interviewees to be held shortly and prior to the completion of the final report.

**Table 2: Typology of urban agriculture activities**

<b>Food system sector</b>	<b>Urban agriculture activity in Melbourne &amp; Gold Coast</b>
<b>Production</b>	<p>Aquaponics – CERES demonstration project</p> <p>Backyard Gardens / Permablitzes</p> <p>Community Gardens</p> <p>Greenroof vege garden, 131 Queen St</p> <p>Guerrilla gardening – Queens Parade</p> <p>Hydroponics – backyard</p> <p>Hydroponics – commercial-scale production, e.g. Australian Fresh Leaf Herbs Pty Ltd (Casey)</p> <p>School Gardens</p> <p>Market gardens / peri-urban commercial production – Werribee / Casey-Cardinia / Mornington Peninsula / Yarra Valley</p> <p>Nature strip planting – Darebin and Port Phillip</p> <p>Permablitzes</p> <p>Permaculture Gold Coast</p> <p>Rosecreek Estate, East Keilor</p> <p>Street planter boxes, Fitzroy</p> <p>Urban beehives / CBD beehives</p> <p>Urban food forest, City of Northcote Library</p> <p>Urban orchards – olive grove in Darebin Parklands</p>
<b>Production &amp; Training for Long-Term Unemployed</b>	<p>Food Skill, Geelong</p> <p>Collingwood Children's Farm</p>
<b>Processing</b>	<p>Individual preserving</p> <p>Rosecreek Estate – winery and olive oil</p> <p>Numerous Gold Coast hinterland wineries, olive oil processors &amp; one coffee producer</p>
<b>Distributing / Exchange</b>	<p>Footscray Wholesale market</p> <p>Monthly Food Swaps (15-20 across Melbourne)</p> <p>MerriStem community nursery, Brunswick – Seed and Plant Exchanges</p> <p>Urban food maps</p>
<b>Retailing</b>	<p>CERES Fair Food</p> <p>Friends of the Earth Food Co-op</p> <p>South Melbourne Commons Food Co-op</p> <p>Farmers' Markets / Community Farmers' Markets (4 in Melbourne, 8 in Gold Coast)</p> <p>Farmhouse Direct – Partnership between VFMA and Australia Post</p> <p>Local food-oriented restaurants</p> <p>Food Connect (SEQ)</p>
<b>Preparing</b>	<p>Community kitchens, attached to community gardens &amp; / or run independently</p>
<b>Eating</b>	<p>Healthy Eating work of health promotion teams</p>

<b>Food system sector</b>	<b>Urban agriculture activity in Melbourne &amp; Gold Coast</b>
<b>Waste / recycling</b>	Backyard composting Community garden composting Food rescue, Food Bank / SecondBite
<b>Education / Research / Networks</b>	City of Casey / VicHealth – Casey Food Hub scoping study Collingwood Children’s Farm Food Alliance – A Healthy and Resilient Food Supply for Victoria Masters in Urban Horticulture, University of Melbourne Urban Design Studios, RMIT University Moreland Food Gardens Network, Food garden mapping Port Phillip Urban Fresh Food Network (PPUFFN) Stephanie Alexander School Gardens VEIL – Food Supply Scenarios VEIL / Heart Foundation / Food Alliance – Food-Sensitive Planning and Urban Design (FSPUD) VEIL - Arable land (urban / peri-urban) scoping study VicHealth – Benefits of Local Food Supply VLGA – Food Security Network
<b>Policy / Projects</b>	The Gold Coast Scoping Study for Local Food Production and Purchase Bunyip Food Belt Project Food Alliance Food Security Policy, Maribyrnong City Council Food Policy, City of Melbourne Obesity Policy Coalition Parents’ Juries Sharing abundance Urban agriculture guidelines, City of Yarra VicHealth – Food for All project VicHealth – Healthy Communities Initiative (funding 10 LGAs via Federal DoH Preventative Health – ANPHA – funding)

As is clear from this table, the bulk of activities are clustered in certain sectors, namely production, education and research, and policy and projects. There is relatively less activity in the other sectors although we recognise that there is considerable activity which this project has not captured: we have not, for example, conducted a survey of commercial and micro-scale food processing and manufacturing in and around our two case study cities.

In summary, local practitioners have a range of views as to what constitutes urban agriculture: from the narrow to the broad. Just as the literature spans a number of different conceptions and descriptions, so too did our interviewees. Most however were prepared to take an inclusive approach and rather than say that certain activities had

no place under the panoply of practices, they more often expressed interests in activities that they had not previously heard of or considered in this way.

#### **4.2.6 What are the barriers to more widespread adoption of urban agriculture in Australian cities?**

The research has revealed that, with few exceptions, participants firmly believe that urban and peri-urban agriculture has a significant, and in many cases, highly significant, role to play in climate change adaptation and mitigation; in meeting current and future food security needs of the growing city; and in building a sustainable, fair and resilient food system for the future.

Participants identified three main sets of barriers that we can classify as political, economic, and cultural.

The principal political barrier is the perceived lack of any strategic vision for a sustainable and resilient food system, in the two case study cities or their respective estates. As discussed below in relation to peri-urban agriculture, this expresses itself most acutely in relation to the expansion of the urban growth boundary over prime farmland; but it is seen more broadly in the failure to fully integrate considerations of health and well-being into state and federal planning and policy frameworks.

The previous government of Victoria (Brumby administration) attempted to establish a state-wide, whole-of-government, integrated food policy. Some interviewees suggested that this policy initiative ‘ran into the sands of obstructionism’ from within the Department of Primary Industries which was not convinced of the need for it.

*So we had a reasonable commitment to doing this. But it really just dragged. And when I look back now to some of the stuff we'd come up with, and got committed to in regional policy and climate change food strategy, that we will do this whole-of-government food strategy, and we do understand why we're doing it, and it has strong links to climate change, and everything else – now we know that DPI was just basically stalling it, at every possible opportunity. You'd have everything agreed, everyone on side, and then you'd get this memo, saying, you can't have this, why don't you re-write it like that. And we'd be completely back to scratch. And there was just dragging of feet, and heels – so much time and energy going into something, that was almost like a plaything at one level. They had to be forced. If the political will's not there to really make it happen, it doesn't matter how much pushing you do up from the policy officer level. Yes, there was an incredible educational process for the people involved. We took that many people from traditional DPI, who thought that food security is just about choice, and if people are fat, it's because they're eating the wrong food, through so many discussions of explaining, opening people's heads ... I'm sure it had a lot of educational benefits for a lot of people, but [ultimately] it didn't deliver anything on the ground [Former state government employee].*

In reflecting on the failure of this attempt to establish an integrated and holistic state-wide food policy for Victoria, which would, amongst other things, have accorded a prominent role to urban and peri-urban agriculture, and in particular to the protection of prime farmland close to the city, this interviewee identified a culture inside the State

government, especially at more senior levels, which strongly militates against policy change of this nature:

*People would just say, agriculture's DPI, but that wasn't what I was talking about. So I really began to see how this handballing phenomena worked inside government; and that trying to get people to talk about complex issues who didn't have clear lines of responsibility was very difficult. You can get those conversations happening at officer level, and maybe at manager level, but it's very hard to get real openness to people above that [level] thinking outside the box [Former state government employee].*

In Queensland, the Newman government has commissioned an inquiry into the State's agricultural and resource industries, but this focuses primarily on identifying and removing unnecessary regulatory barriers, and there is little recognition of land use conflicts except in relation to tensions between farmers and miners in, for example, the Darling Downs.

In addition to important issues such as the loss of prime farmland to urban expansion, foreign ownership of agricultural land and land hoarding, interviewees also raised the issue of the corporate domination of the food system, and its impact on farmers, suppliers and consumers. The concentration of ownership within the Australian food system leads to the third barrier identified by interviewees, namely cultural factors of which there are two principal aspects. One is the prevailing culture of cheap food, and the convenience of take-away, which can lead to widespread complacency about food, its provenance and availability and about issues of waste:

*Why do people buy so much food that they throw out? Why is there such a disregard for food? If you could turn that into dollars, people would certainly have a concern about how much they were throwing away [City of Yarra urban agriculture officer].*

This complacency leads to the second aspect of the cultural barrier which participants identified, a widespread lack of awareness of the key issues and problems concerning the food system, and engagement with them:

*There is a real lack of awareness of the need to change. Most of the population is not aware. People need to be more uncomfortable, or have barriers to action removed, such as cost incentives. It's really troubling that so many people don't have basic food growing and preparation skills. We set up a garden in a neighbourhood house, but a lot of people there will look at silverbeet and not know what to do with it. And this applies across the wider population – we're lacking basic cooking, and food preparation, and preserving, skills. There's a psychological shift that needs to happen, for people in general to value food growing as a worthy thing to do. People forget that there's a farmer behind every meal they eat [Permaculturalist and backyard gardener].*

Our interviews with the farmers and growers revealed, however, that urban sprawl was not their principal concern. Nor was climate change. Rather, it was the commercial, financial and regulatory pressures they were facing, which took the form of a so-called 'cost-price squeeze' in which as the cost of inputs rose and the burdens of regulation

increased, the market dominance of the supermarket duopoly in Australia is leading to falling farm gate prices. One farmer described the dairy sector in these terms:

*There are basically three sectors in this industry: the good operators, with low levels of debt; the good operators, with high levels of debt; and those for whom it's just a struggle. That last group tends to be younger people, and they get very little returns. The demographics of farmers show that we're getting older. The industry has gone through a huge rationalisation: there were 33,000 dairy farmers in Victoria in the 1970s; now the country as a whole has 17,000. Two-thirds of the dairy farms in Gippsland have disappeared [Dairy farmer, Mornington Peninsula].*

For this farmer, the regulatory burdens constituted 'death by a thousand cuts':

*It's not any one thing – it's everything together. There's the cost of rural wages, and all the on-costs: super, Workcover, payroll tax. And then there's taxes on taxes, like the fire service levy, and parental leave. Four departments take their levies out of the milk cheque. The carbon tax will impact on our power costs, our fuel and transport. Then we have multiple audits of the milk factory, by the MLA, and the EPA, and Food Standards. Food safety is necessary, but the red tape is very difficult. There's no one-stop department, and reform doesn't happen, because bureaucrats have a vested interest in keeping things the way they are [Dairy farmer, Mornington Peninsula].*

In the same vein, a smaller-scale market gardener from Casey-Cardinia commented on the pressures and burdens she and her husband faced in their business:

*Probably fuel and labour costs. Some of the regulations are a fair call, and some are simply odd with the wonderment of keeping someone shuffling paper to give them a job. Paper shuffling (although necessary to some degree) is time consuming and not a priority of how we like to run our business, so the less minimal the better as our occupation is very physical and we are not always educated to deal with some of the paper jargon related to regulations. I personally think Australia is paranoid about regulations - we live in a clean green country and I would like to see imported produce from China regulated and not given random regulation on a percentage of produce but the whole lot, just like we are accountable, it is totally contradictory [Smaller-scale market-gardener, Casey-Cardinia].*

In and around the Gold Coast, local growers expressed similar concerns about the burden of regulation and about the low margins that exist for many producers:

*We had a guy who ran a poultry farm and brought his eggs to sell in our shed ... but then along came the egg police who said he couldn't sell his eggs because he'd broken some regulations and faced a \$30,000 fine or two years in jail ... he was so overcome by it all that he just gave up and burned all the chooks! [Local producer].*

while a representative of Queensland farmers observes:

*It is imperative that farmers can compete on an equitable playing field..[however]..it appears that in recent years the pendulum has swung away from Australian farmers [Farming peak body representative].*

Finally, we offer a short case study of an attempt to set up a community garden as an illustration of some of the barriers in practice faced by groups of local enthusiasts, even in an environment where support is forthcoming, in principle, from local government.

As part of its promotion of 'an active and healthy community', GCCC promotes community gardens as a way of increasing food security in the city and has prepared a Community Gardens Start Up Kit for groups wanting to develop such a local initiative. Linked to this process of support, the Council has appointed a dedicated worker to liaise with local groups planning a community garden and a number of Divisional Councillors have allocated funds from their Divisional budgets to support initiatives in their communities.

One such group formed after their Divisional Councillor called a public meeting to promote the idea of a community garden in the Division. They were pleased to learn that '...all we had to do was form a steering group and get 14 members signed up', which they achieved quickly. However, they then learned that they would either have to become an incorporated body or exist under the auspices of a relevant existing body, such as a large community based, no-for-profit organisation. As the auspicing option seemed most convenient they then approached a large national organisation with a significant presence on the Gold Coast, who agreed to act in this capacity. They then learned that this body was deemed by the Council not to be primarily concerned with urban agriculture (however broadly defined) and hence unsuitable as the auspicing organisation. The embryonic group then decided to incorporate, with the help of a local food activist with experience of setting up groups.

The newly incorporated group were offered two possible sites for their garden by Council, the with then Community Gardens support office saying of the preferred site, '...it's ready to go, you might need to talk to some of the users to say this is happening and if you can get some support from the community that would be great'. However, they were then told that the site was no longer suitable and decide then to local at all public parks in the neighbourhood and choose those that seemed to best suit their needs and preferences.

Having identified a preferred site, the group then began to work with the support officer to draw up plans for the garden itself,

*... so we were looking at our site and X had helped us draw up our plan and everyone was getting very excited , it seemed very real and we were told – you know you have to go out and quotes for all the different parts of the garden – so we'd formed sub-committees that were looking at the price of a fence and all the bits and pieces and then we were told – oh no, sorry, you can't have this site because its Q100 flood zone and therefore you can't have any built structures in the area at all.*

The group then met with the Divisional Councillor and the latest support worker to review all the suitable parks in the Division and identified one that appeared suitable, although with the added complication that it was a state park and would require a development application. As part of this process the council wrote to local residents notifying them of the proposal to establish a community garden within the park:

*... the residents of S Park called a public meeting, which some of us attended, and the residents were extremely aggressive and they were really feeding off each other and getting very, very upset about the situation...it was going to bring down property prices and there was somebody there who worked in a real estate agents saying this again and again so they really picked that up. And then one of our members was actually accosted [by someone] who said – you won't get a garden there over my dead body, I don't want o you hippies coming in selling your drugs and turning my kids into druggies – so that was very hard for some of our members because most of them are older and retired. Most of them are not gardeners at all...a lot of the regular members are single women, older, around 60...and R who's a permaculturalist ...*

After this meeting it was clear to the group that this site was not viable because of the intensity of local opposition and they agreed instead to invite a council officer from Gold Coast Parks to attend one of their meetings to talk about what might happen next. This has not yet occurred and the group now rents a plot at a site run by Gold Coast Permaculture so that those keen to grow food are able to do so.

The experience of dealing with the council has not been especially encouraging for the group, although they recognise that support has been forthcoming from both officers and councillors. The main problems appear to have been in relation to communication and to joined-up local governance (or lack of it). It appears that a consistent message about what is possible and where it might be possible has not been forthcoming from council. This may well reflect a lack of communication between different sections of council. There is also evidence of a somewhat heavy handed regulatory approach, again compounded on occasions by poor communication. For example, in planning the fencing for their garden the group was required to obtain a number of quotes for their preferred fencing, but ultimately discovered, '...oh you can have any style of fence you want, but it has to be three foot high with black mesh!'.

The group also experienced significant problems in planning for toilet facilities, as one of the designs presented to them (by one of the support officers) was for vegetable beds accessible to people in wheelchairs. This in turn triggered a requirement to provide a toilet accessible to disabled people and a debate about the scope for providing a composting toilet that also met this requirement. The point is not that the group was opposed to making the garden accessible or that they were insistent on a composting toilet, rather than what was acceptable or not to the Council was never entirely clear to the group.

These issues were compounded by the group adopting a highly participatory style of organisation, which of necessity required meetings of the membership to determine their requirements and preferences. Unsurprisingly, after over two years of planning for a community garden but not achieving one, the active membership of the group has dwindled to between 10 and 20 people, out of a total membership of around 90. And some active members are concerned that their initial reasons for joining are not being fulfilled:

*I joined the garden to be outside and to talk to people; I seem to spend most of my time sitting in front of the computer screen doing the administration for it.*



while another mentioned that they thought the council's template would tell them what to do:

*... so we wouldn't have to do anything like this, all we would be doing was digging in the garden or whatever and you know, planting plants.*

This short case study illustrates how the best of intentions from a variety of prospective partners do not always lead to successful outcomes and may even frustrate people with valuable enthusiasm. If Gold Coast City Council is to realise its ambition of supporting a citywide network of productive and flourishing community gardens and to extend this support to other forms of urban agriculture then it must re-state the political commitment to this aspect of its city building ambitions, ensure that different parts of the council work more effectively together and allocate sufficient funds to make a difference. A review of local regulatory regimes to determine their impact on small scale urban agriculture would also be welcome.

## 5. CONCLUSIONS

There is growing concern about the vulnerability of our cities to a number of factors, including peak oil, global economic crises and climate change. Each of these is likely to have profound effects on the security of urban food supplies. Recent disasters, especially floods, have highlighted the fragility of food supply lines to Australian cities. Experience in the rapidly growing cities of the global south provides vivid illustrations of the damaging consequences for social order and civility if food security is seriously compromised in anything but the very short term.

Most theoretical and conceptual work on food security derives from and in many respects is most applicable to developing countries and to cities in developing countries. As Australia is not a developing country, the question is: do concepts of food security from developing countries apply to Australia? And if these concepts are applicable, can they be modified to take account of the particular circumstances of a developed country like Australia?

This section summarises our findings and conclusions under three broad headings: meanings and conceptualisations of food security; the anticipated impacts of climate change on food security; and the contribution of urban agriculture to building urban resilience, before closing with a brief discussion of future possibilities.

### **5.1 *The concept of food security***

Most theoretical and conceptual work on food security derives from and in many respects is most applicable to developing countries and to cities in developing countries. As Australia is not a developing country, the question is: do these general concepts of food security from developing countries apply readily to Australia? If these concepts are applicable, can they be modified to take account of the particular circumstances of a developed country like Australia?

There is growing global concern about the vulnerability of cities to a number of existential threats, including peak oil, global economic crises and climate change. Each of these is likely to have profound effects on food security in general and on the security of food supplies to cities in particular. Recent disasters, especially floods and storms, have highlighted the fragility of food supply lines to Australian cities while the rapidly growing cities of the global south provide vivid illustrations of the damaging consequences for social order and civility if food security is seriously compromised in anything but the very short term.

Food security is typically defined in terms of access to food as well as its affordability and availability while some also refer to the cultural acceptability of food and to the agency of institutions promoting greater food security (FAO, 2006; Ryerson Centre for Studies in Food Security, 2013). But other related concepts are also used increasingly in policy and other debates as a result of criticism of the limited and absolutist conception of the FAO approach. Food sovereignty, for example, was introduced by the International Peasant Farmers' organisation La Via Campesina in 1996 as a necessary precursor for food security (Patel 2009) and while there is a diversity of understandings of food sovereignty, at the heart of most is a rights-based approach

allied to strong notions of autonomy in local food systems. In the ground-breaking International Assessment of Agricultural Knowledge, Science and Technology for Development, food sovereignty is defined as 'the right of peoples and sovereign states to democratically determine their own agricultural and food policies' (McIntyre, et al., 2009, p. 111). More than simply about access, food sovereignty seeks to make transparent the power relationships inherent in agricultural and food systems as a precursor to changing these into more equitable systems.

As more of the world's population lives in cities, so questions of food security and food sovereignty increasingly take on an urban dimension. While much debate is concerned with how to produce enough food for a growing urban population and how to secure lines of supply from rural places of production to urban places of consumption, greater attention is now also being paid to the systems of production, processing and distribution of food within urban areas. Recent recognition of the extent of food wastage (Institution of Mechanical Engineers, 2013) illustrates that food security should not be limited, conceptually or practically, to the nature and volume of production but extended to matters of distribution, access and control.

The production of food within urban areas is an important component of urban agriculture, along with systems of food processing, distribution and sale. The management of waste from these processes is another important element in this broad conception of urban agriculture. There is scope, therefore, for urban agriculture to make an important contribution to strengthening urban food security. This can in turn help build urban resilience and promote more sustainable forms of urban life.

Urban resilience has entered the lexicon of urban studies and indeed urban policy in recent years and typically takes a broad view of the capacity of cities of respond to or recover from external threats and shocks. Pickett et al.(2004) propose the metaphor of 'resilient cities' as a means of linking the disciplines of ecology and planning into a more productive relationship to better understand some of the major problems confronting contemporary cities and indeed to propose effective solutions to them. They propose also that the 'old paradigm' of ecology based on an equilibrium model is replaced by a non-equilibrium paradigm which connects structure and function in such a way that resilience becomes the ability of a system to adjust in the face of changing conditions rather than simply returning to its previous equilibrium condition after a disturbance. In the context of urban resilience or the resilience of cities this 'new paradigm' is especially valuable as the uncritical pursuit of a past condition is unavoidably retrograde and almost certainly doomed to failure.

In contrast, University College London's Centre for Urban Sustainability and Resilience adopts an engineering focussed view of resilience and describes it as:

*a newer concept [than sustainability] dealing with the issue of how to mitigate the effects of environmental disasters and terrorism, incorporating seismic and volcanic hazard, flood risk, the spread and control of disease, security and situational awareness (UCL CUSR website: why urban sustainability and resilience?).*

One of the key questions posed at the outset of this review concerns the capacity of urban agriculture to play a more prominent role in enhancing food security and hence

urban resilience. This inevitably calls for speculation, although we hope to have provided some evidence on which this speculation can be built.

There appears to be a significant dislocation both in the academic literature and in contemporary policy discourses between two approaches to understanding food security. On the one hand, long established conceptions of food security frame the issue as a matter primarily of aggregate production in which relatively unfettered market mechanisms can be relied upon to distribute food at all spatial scales in the most efficient and equitable manner. Absolute shortfalls in food production are to be addressed by the development and application of new farming technologies, while more localised shortages are dealt with by the refinement of market mechanisms and by social programs targeted at populations and groups considered to have special needs. On the other hand, an emerging analysis and policy framework takes a more political approach and focuses on the rights of individuals and communities to determine their own food needs and to play a more prominent part in meeting them through the establishment of more localised food systems. For the sake of convenience we describe these approaches as traditional/macro and critical/micro respectively.

## ***5.2 Impacts of climate change on urban food security***

These two contrasting conceptions or approaches differ also in their stance on the impact of climate change on food security. The traditional/macro perspective tends to respond to predicted climate changes by exploring new areas for food production and by promoting research and the development of new crop strains that can withstand greater heat, less water, increased soil salinity and so on. There is also some recognition that new farming and food growing methods might also need to adjust to factors such as peak oil, financial sector instability and unpredictable fluctuations in world food prices (DAFF, 2012). The critical/micro perspective tends to see climate change as one of a number of serious threats to food security and indeed to globalised, market-based forms of economic, social and political organisation. The response from this perspective to all of these threats is typically to call for reductions in overall consumption and for the more rigorous application of the principles of sustainable development in creating more localised systems of production, distribution and consumption (Australian Food Sovereignty Alliance, 2012; Klein, 2011).

Those who attempt to find common ground between these positions often struggle to do so successfully, while some who acknowledge the serious impacts of climate change and who call for radical changes to current food systems fail to recognise the urban dimensions to this problem. The Report of Commission on Sustainable Agriculture and Climate Change (Bennington et al., 2011) for example calls for 'major interventions at local to global scales to transform current patterns of food production, distribution and consumption' (p. 4) and recognises that 'the threats posed by climate change to food supplies and livelihoods are likely to be spatially variable' (p. 4). However the report goes on to call for a '...widely shared appreciation of agriculture as a multifunctional enterprise that delivers nutritious food, rural development, environmental services and cultural heritage...' (p. 8, emphasis added). Similarly, while it calls the empowerment of smallholder farmers (p. 9) and advocates reductions in food waste loss (p. 11) there is little sense that these might be significant in urban as

well as rural settings. In its short review of food security and climate change policy and practice in Australia the report there is no mention at all of the urban dimension.

In Edwards et al., (2010) discussion paper for NCCARF on food systems, climate change adaptation and human health in Australia the urban dimension of climate change impact is recognised as a threat to some current supply chains and acknowledgement that 'grassroots community responses have begun to emerge in urban areas with householders and communities establishing new forms of production and distribution' (p. 24) and that these have the potential to grow.

In short, there is widespread recognition that substantial changes to the climate across Australia will have profound impacts on agriculture and hence on current systems and patterns of food production, distribution and consumption. There is limited recognition of the urban dimension to this, especially of the likely impacts on the security of food supplies to a predominantly urban population.

Food production in and around cities will be subject to very similar climatic changes that affect rural areas, indeed some of these changes may be even more pronounced in cities that are more susceptible to heat island effects, the effects of flooding and the impacts of storms. In terms of the impact of more localised systems of food production which are less reliant on synthetic fertilisers on the generation of greenhouse gases, we found very empirical studies and there is clearly scope to develop and extend this research agenda in the future.

### ***5.3 The contribution of urban agriculture***

Studies of the scope and contribution of urban agriculture to improving urban food security and building urban resilience typically take the form of localised case studies with an emphasis on advocacy. There are very few large scale, empirical studies of the contribution that existing forms of urban food production can make to overall urban food security and we see a similar set of contrasts between the traditional/macro and critical/micro perspectives described above.

The traditional/macro perspective typically sees primary food production as a rural activity although food processing, distribution and consumption may take place in cities and metropolitan regions. Urban agriculture is essentially a small-scale activity, involving backyard growing for personal consumption alongside community gardens, as well as a range of communal food growing activities (including food swaps, guerrilla gardening and permablitzing). While peri-urban market gardening may once have supplied a significant proportion of food for cities, the loss of peri-urban land to suburban expansion is accepted as an inevitable consequence of the growth of cities.

From this perspective there is little prospect of urban food production making a significant contribution to overall patterns of urban food consumption or to urban food security. Yet at the same time, the critical/micro perspective tends to attach greater significance to what already takes place under the broad heading of contemporary urban agriculture and to see greater potential for it to play a much more prominent role in the future as existing systems struggle to deal with increasing perturbations.

In many respects these contrasting perspectives reflect fundamental value positions that are not especially amenable to empirical verification or refutation. Those who believe that Borlaug's Green Revolution and global market mechanisms have produced one of the world's greatest success stories (Perkins, 1997) are unlikely to become advocates of local food systems, while committed locavores are likely to remain unconvinced by the economic case for global specialisation and transportation or for the use of crops genetically modified to cope with more heat or less water.

Of course the positions described above represent simplified versions of positions at opposite ends of a spectrum, and in between a wide range of complex and more nuanced positions exist. Nevertheless, as Jonathon Porritt (then Chair of the UK government's Sustainable Development Commission) observed in his 2009 Campden lecture:

*...one might legitimately despair at the quality of the current debate on food security [where] 'free market absolutists' battle it out with 'self-sufficiency evangelists' (Porritt, 2009:7).*

Based on this, it is possible to conclude provisionally that urban agriculture in all its forms can play a more prominent role in enhancing urban food security and in building greater urban resilience. However, the more important question is one of scale and degree: how much more of a prominent role can it play? Can it make a substantial contribution and how might this be calibrated and measured?

In our review we looked for research that attempts to quantify the current extent of urban agriculture in Australian cities and which tries to quantify its future potential. We did not find any substantial work of this nature, although there are some more impressionistic and localised studies. It should be noted that while we recommend that more systematic empirical work of this nature be commissioned in the future, it was beyond our remit to conduct any primary research of this type.

To maximise its contribution and impact, urban agriculture should be integrated into broader food systems and recognised in more comprehensive programs of metropolitan planning for greater resilience and sustainability. But food policy is rarely joined up with other policy fields and if it is to become more influential it must become more integrated with other elements of urban policy, including those designed to tackle urban poverty and to promote greater social cohesion and economic integration. While the urban poor clearly experience all too intensely the effects of food insecurity and have limited means to overcome these effects, food insecurity sometimes affects all urban residents. Relatively wealthy urban residents may be better able than their poorer neighbours to afford healthy and nutritious food and to stockpile in anticipation of emergencies, but they will nevertheless be similarly affected by major disruptions to urban food supplies.

Climate change is likely to lead to more extreme weather events, which are the main source of these major disruptions to urban food supplies. Moreover, the viability and productivity of existing food production systems are also likely to be seriously compromised by local manifestations of climate change. Urban agriculture has the potential, therefore, to contribute to the adaptations that all cities must engage in if they

are to become more resilient in the face a variety of existential threats, including climate change. Insofar as it represents a form of localised food production and consumption that requires fewer energy inputs than more spatially extensive and energy intensive forms, it also has the potential to help mitigate the factors causing climate change.

To date few studies have attempted to quantify the potential of urban agriculture to make cities more food secure, but there are many which describe and catalogue its social and community benefits. These include the development of stronger social connections in urban communities, increased awareness of the benefits of fresh fruit and vegetables and locally produced food in a healthy diet, greater appreciation of the sources of food and of the connections between processes of food preparation and food quality. Urban agriculture also has the potential to re-establish connections between food and place that were once common in Australian cities, but which have to a great extent withered over the last four decades. All of these social impacts may be as significant as the nutritional benefits of eating more locally grown food.

The increasingly complex systems of regulation that operate within Australian cities, especially those relating to land use planning, health and safety and the operation of small businesses, often serve to thwart attempts to develop new forms of commercial urban agriculture as well as more community based and not for profit initiatives. While this may not be the intention of such regulatory regimes, they nevertheless often inhibit unnecessarily these new enterprises.

Projected state-wide and regional climate change impacts suggest that urban and peri-urban agriculture may, because of their relatively secure access to fresh water, come to assume an increasingly important role in supplying food to Australian cities in a climate-constrained future. However, these same peri-urban areas have always been and will continue to be the site of intense conflict between those wishing to preserve various aspects of this environment, including food growing and amenity, and those who prefer this land to be available for the expansion of urban and suburban development. The capacity of local and regional planning regimes to manage these conflicts successfully remains the subject of much debate.

Urban agriculture represents therefore one of a number of important ways for cities to adapt in the face of climate change. It is highly unlikely that the major cities of Australia will ever become completely self-sufficient in food, but through greater support for urban (and peri-urban) agriculture, they could become more food secure. This in turn would contribute to building the overall resilience of Australian cities and to their sustainable growth in the future.

As the literature review revealed, there is no single and widely accepted definition of what 'food security' means, either generally or more specifically in the urban context. With each interviewee we explored their understandings of food security and these confirmed this definitional disagreement apparent in the literature. Most of those directly involved in urban agriculture took what was described above as critical/micro perspective, while many of those engaged in more traditional forms of agriculture in the peri-urban fringes adopted a more traditional/macro standpoint.

Many interviewees of both standpoints identified numerous benefits of urban and peri-urban agriculture and highlighted its multi-functionality. They felt it was important that policy-makers not see the issue of food security and urban agriculture solely in terms of its potential contribution to food supply, or in terms of its climate change mitigation capacity. Rather, they stressed the importance of looking holistically at the social, environmental and economic benefits of urban agriculture and recognising its contribution to the construction of a more sustainable, fair and resilient food system. As one interviewee put it, policy makers need to appreciate the 'social yield' of urban agriculture in addition to its food and nutritional yield, in terms of individual health and well-being, increasing skills and capacities, and in creating and strengthening community. Conversely, those comfortable with the current system of food production and retail distribution saw little need for it to become more sustainable, fair or resilient.

The research revealed that Melbourne appears to be experiencing a renaissance of urban agriculture, in diverse forms and locations, while in the city of the Gold Coast there is less activity at present but clear potential for a similar expansion. For many interviewees, climate change emerged as a key driver and motivation. However, it was far from being the only driver; and many interviewees spoke of the importance of placing it alongside other factors such as peak oil, loss of biodiversity, economically unviable farms, and the negative impacts of an obesogenic environment, into a more holistic understanding of a 'sustainable and resilient food system'. There is a clear nexus, therefore, between climate change, these various other factors, and emerging understandings of urban resilience and a more resilient food system.

In contrast to the majority of interviewees, many of the commercial farmers and market gardeners we spoke with did not regard climate change as a significant cause for concern in terms of their agricultural activities. Indeed, they expressed considerable scepticism as to whether anthropogenic climate change existed as an empirical phenomenon. This is consistent with what other interviewees reported as a discernible trend within state and local governments towards scepticism and even denial of climate change as something requiring policy attention.

Supported by the findings of the literature review, the case studies revealed that diverse practices of urban (and peri-urban) agriculture have a significant (though as yet unquantified) role to play in meeting many of the challenges of urban food security and building greater levels of urban resilience. The case studies also explored the barriers to the further expansion of urban and peri-urban agriculture in Melbourne and the Gold Coast, and whether and how these barriers might be overcome. A long list of barriers was identified, ranging from the political and regulatory, to the economic, cultural and environmental. High levels of soil contamination, for example, were mentioned as a factor limiting the expansion of urban agriculture in Melbourne, although less so in the Gold Coast where there is much undeveloped land within the current urban footprint. Commercial farmers and market gardeners highlighted the regulatory burdens and cost pressures they face as a principal threat to their viability. Several interviewees identified the market dominance of Australia's supermarket duopoly as a key obstacle, especially in terms of the economic viability of smaller-scale farmers and growers. The loss of Melbourne's peri-urban farmland due to urban sprawl was frequently mentioned but this was of less concern in the Gold Coast where much of the peri-urban land attractive to developers has not to date been used for agriculture.



Interviewees offered numerous innovative ideas for how these barriers might be overcome. Some mentioned the model of the Agricultural Land Reserve in Vancouver as a successful example of the protection of prime peri-urban farmland from the pressures of urban sprawl. The Bunyip Food Belt project is a multi-institutional consortium aiming to expand water infrastructure to the peri-urban market gardens in Melbourne's south-east borders, with the aim of increasing food production and creating the basis for value-adding and local economic development. The CERES Environmental Education Park in Brunswick is piloting a model of bio-intensive city food production, centred around small-scale aquaponics infrastructure, and in partnership with schools, as a way of making urban farming financially viable and thereby attracting young, capable and enthusiastic people into the industry. Aquaponics and hydroponics were also held up as models of climate-ready urban and peri-urban food production, given their minimal consumption of water compared to conventional agriculture, their capacity to control external factors such as temperature and extreme weather events and their comparatively high levels of productivity. In the Gold Coast, the use of formerly derelict land by Permaculture Gold Coast to grow food, produce high quality compost using waste supplied by the City Council and to use their facilities to run highly effective job training schemes, point also to the potential of multi-faceted local initiatives focussed on food production.

#### **5.4 Future possibilities**

As many submissions made in response to the National Food Plan issues paper (Australian Government, 2011b) make clear, so long as Australia is presented as a food secure country it can be difficult to promote measures to make Australian cities more food secure. While there is some recognition and acknowledgement that certain groups in Australian society are experiencing and indeed suffering from food insecurity, there is little recognition that Australian cities depend for their food on supply lines that are clearly vulnerable to disruption by local extreme weather events as well as by global economic and geo-political factors.

Planning for so-called 'natural disasters' may address some of the problems of supply, but there is very little recognition or acknowledgement at Federal and State level that urban food security might be improved through the development of more localised food systems for urban or metropolitan areas. Some local authorities have made more progress on this front, but their capacity to support extensive action within their own jurisdictions let alone coordinate their actions with others, is limited.

The UK government's Chief Scientific Advisor, Sir John Beddington referred recently to 'the perfect storm' facing conventional food and farming policies and in the report of the Commission on Sustainable Agriculture and Climate Change described how business as usual would not bring food security or environmental sustainability (Beddington, 2011). In response, Porritt (2009) has proposed four principles that should underpin any necessarily radical new approach to improving food security. The first is termed resolarisation and refers to a systematic reduction in our dependence on stored solar energy or fossil fuels (including to fix nitrogen in our soil) and greater use of real-time solar energy as a fuel and, through the planting of legumes, to fix soil nitrogen. The second is relocalisation, which refers to the attempt to reduce the length of food supply chains, rather than achieving total self-sufficiency in production and consumption within

a given area. The rationale for this principle is that reducing the length of supply chains reduces their vulnerability to disruption by any number of factors, which in turn strengthens the resilience of these supply chains. The third principle is also a product of the first two principles and refers to the revitalisation of local economies and food systems through the prioritisation of and public support for local food production. There are numerous examples of new forms of local production, processing and sale taking place in cities around the world, including those that enjoy the support of municipal governments (Belo Horizonte in Brazil, Vancouver in Canada) and those more autonomous initiatives (e.g. Todmorden, UK). The final principle and a consequence of the success of the preceding principles is resilience, in which urban food systems increase their capacity to adjust to substantial changes in broader urban systems.

Our research has shown a wide range of activity at the local level, by schools and hospitals, by community groups, by households and neighbours, and by small scale commercial food producers and processors. Many, but not all, share a vision of a more varied and hence more resilient local food system that at the same time contributes to greater urban resilience and equity. However, we can only conclude that most of these local initiatives are flourishing without the support of robust policies and programs from any of the three levels of government. If greater support was forthcoming we could reasonably expect to see even greater activity that increases urban food security and helps build urban resilience in the face of climate change.

## 6. GAPS IN RESEARCH AND POLICY AND FUTURE DIRECTIONS

In this final section we describe the main gaps apparent in two domains: in research and in policy and practice. The research gaps stem from our review of existing literature which, while not claiming to be a fully-fledged systematic review, is sufficiently robust to identify areas where further research could fruitfully be undertaken. In the domain of policy and practice, our identification of gaps is inevitably more contentious, as it involves suggesting areas of current policy weakness, areas where policy may be having unintended and undesirable impacts and areas that may presently be designated as not appropriate for policy intervention.

Moreover, in practice the distinction between research and policy development is not always clear cut. Research often entails the study of food growing and processing in practice – policy development usually makes some reference to existing research; and policy implementation invariably requires some changes to established practices as well as the assessment of what works.

These suggestions are intended to stimulate debate and do not represent a comprehensive profile of research or policy gaps.

### 6.1 *Research gaps and future directions*

The following topics are currently the subject of extensive research and could usefully be addressed in future work:

- research on soil quality and contamination in urban areas, and on the impact of airborne particulates on food grown in urban areas;
- down-scaling to the metropolitan level of climate change impact models with particular attention to those factors important in determining the viability and productivity of food growing;
- detailed regulatory impact studies of measures that govern the production of food in urban settings, including growing animals, food processing and the regulation of food sales;
- research on actual and potential yields from various types of urban plots and forms of urban agriculture, including aquaponics and intensive permaculture methods.

These scientific studies could best be undertaken as joint ventures between university-based research teams, bodies such as the CSIRO and research units with governments.

Local mapping exercises will also be important in establishing the evidence base for local policy development:

- charting the extent and location of different forms of food production, processing, distribution and sale within cities and their peri-urban hinterlands;

- mapping the location of sources of healthy and unhealthy food in cities, as well as the accessibility of these locations, including walking distances and public transport proximity.

Mapping of this sort would capture important quantitative data that could inform future policy and practical actions, and decisions about resource allocations, land use, planning frameworks and infrastructure investments.

Mapping could usefully be accompanied by qualitative ethnographic research to describe and share the extensive food-growing knowledge and techniques that currently exist among those involved in food production, especially among those from immigrant communities. This is a matter of some urgency, as many of the people concerned are well advanced in age and their knowledge could be lost to future generations.

Another important aspect of this mapping would be to undertake food systems assessments, both for individual local government areas, and for wider metropolitan areas. The most effective food systems assessment usually entails some form of participatory action research through which:

*Communities examine the connections between production, distribution, consumption and waste disposal and measure their impacts on the environment, human health and livelihoods through a set of indicators over time. Understanding the trends and relationships between elements within the food system, ultimately assists community members and policy makers in pinpointing areas of concern and working for appropriate and equitable reforms. (San Diego Food Systems Assessment)*

VicHealth is currently supporting the establishment of Local Food Policy Coalitions in several local government areas. Among other things these will conduct participatory food systems assessments in order to create profiles of their local food system. Importantly, these assessments will begin to create, for the first time, a baseline of data against which future interventions and policy changes around the local food systems can be monitored and evaluated. This is a significant advance and the challenge will be to extend these assessments across all Melbourne urban and peri-urban councils; and then to scale them up so that Melbourne as a major urban conurbation has its own food system assessment. This has already been carried out in several major cities in North America, including Vancouver, Oakland, San Francisco, Detroit and San Diego.

Part of the mapping work carried out above, focussing on the yields achieved in different conditions and with different growing methods would answer important questions about the potential contribution of urban agriculture to increasing urban food security. However, in order to fully understand that potential, the amount of green space and other surfaces available for food growing would need to be comprehensively mapped and classified according to soil type, crop suitability, water access, infrastructure requirements, and any other significant constraints. Eventually this could lead to the development of an 'urban agriculture' planning overlay, with prime potential food growing sites clearly identified, within local planning schemes.

Other emerging trends in urban food production, such as green roofs and vertical gardening, also merit study in order to understand their potential contribution. An edible

green roof experiment is soon to commence at Melbourne University's Burnley campus, and the results of that may be significant in demonstrating the potential for similar projects elsewhere. Research was conducted recently in the Gold Coast to assess the scope for retro-fitting green roofs to existing industrial buildings and two industrial estates in the city have been designed and built to include on-site food growing capacity.

The case study research confirmed the view found in much of the published literature that there are many and substantial benefits that urban agriculture confers. However, further research is required on:

- the health, well-being and educational benefits of participating in urban agriculture activities, especially in terms of changes in dietary patterns and the skill requirements for productive food growing;
- the carbon sequestration potential of urban orchards and other soil-based forms of urban agriculture including the most effective methods for increasing the organic content of soils;
- the carbon reduction potential of hydroponics and aquaponics and other potential costs and benefits of these techniques in terms of climate resilience and food security.

Another research gap concerns the demand for emergency food relief services, including the use of the various types of vouchers that agencies make available, either from their own resources or with government assistance. There appears to be no reliable source of information that describes which agencies provide which services, and according to what criteria and conditions. This hinders policy development and from the perspective of potential users of emergency food relief services, can be a cause of considerable hardship. Research should therefore be undertaken to map the current forms of provision of emergency food relief in Australian cities, who the providers are, and what levels of demand they are witnessing for their services. This should include an investigation into whether some forms of food relief, such as food vouchers, can be redeemed at farmers' markets or other fresh food outlets, as is becoming more common in the United States.

Finally research could usefully explore public preferences for different types of food, different approaches to the sale of fresh fruit and vegetables and attitudes to urban food growing. Similarly, willingness to pay studies and discrete choice experiments could explore the price comparison of locally grown and organic food with food grown further afield and under different conditions.

## **6.2 Policy gaps and future directions**

While there is clear evidence of increasing public interest in Australia in food, especially in its preparation and consumption, the popularity of growing one's own food in backyards, community and school gardens and on roadside verges appears also to be increasing. At the same time public health experts continue to warn of the consequences of eating unhealthily and press for a shift in the dietary balance of most Australians away from highly processed foods with high levels of salt, fats and sugars to more fresh fruit and vegetables.

Australian food policy debates reflect these current discourses to some extent, but as the recently published *Green Paper on the National Food Plan* illustrates, there is a preoccupation with large scale agricultural production and its capacity to develop new market opportunities beyond Australia. The belief that Australia has a 'strong, safe and stable food system with a high level of food security' (Australian Government, 2012) supports a focus on feeding the rest of the world, rather than helping Australians feed themselves better.

With this national level focus, it is not surprising that little policy attention is paid to threats to urban food supply lines or to broader conceptions of urban food security and food sovereignty. The experience of the Victorian government's promotion of a more holistic approach to state-wide food policy in recent years demonstrates the potential for state action to enable and encourage exemplary and innovative action at the neighbourhood scale in cities and peri-urban areas. That same experience also demonstrates the fragility of these policy initiatives.

The enthusiasm and commitment of an increasing number of people to local food production, processing, sale and consumption in cities, often as part of broader programs to build urban resilience, can be supported by public policy from all levels of government if there is political will to do so and if the information on the contribution that urban food supply can make to an urban area is accurate (see James et al., 2010 for a discussion on this).

This policy support does not have to be at the expense of other areas of food production, although there may be tensions between measures that support large scale agriculture and the maintenance of a highly concentrated food retail sector and those that support small scale, local alternatives. However, for public policy measures of this type to develop, there has to be a greater degree of awareness and appreciation that Australian city dwellers may not be as food secure as is assumed. In addition to those groups commonly recognised as facing difficulties in accessing and affording nutritious food (people living in remote Indigenous communities, people on low incomes and people with limited mobility), it is important to recognise also that the food supply lines to all Australian cities are vulnerable to a number of threats, especially those increased by climate change, such as floods, fires and storms.

With this recognition, alongside an acknowledgement that urban and peri-urban agriculture in all its forms can play a part making Australian cities more food secure, there is scope to develop a set of policy measures across all levels of government that support and enhance local initiatives.

We offer some initial suggestions for such measures below:

- support for temporary land uses for suitable urban agricultural purposes;
- recognition in metropolitan plans of the existence and value of agricultural land within urban footprints and in peri-urban areas;
- recognition of the value of communal gardening spaces in the assessment of development applications for residential subdivisions;
- collection and use of organic food waste for composting;

- support for school and hospital gardens, including expert advice on gardening techniques;
- regulatory impact assessment processing, selling and consumption of food within cities.

## **APPENDIX 1: URBAN FOOD SECURITY, URBAN RESILIENCE AND CLIMATE CHANGE**

### **A literature review**

**June 2012**



## **Preface**

This literature review was prepared by the research team in June 2012 as an interim output of the project. It has been used to prepare the final synthesis report and is now presented as an Annex for reference. The final synthesis report contains material not included in this literature review.

## Introduction

Globally, and in Australia, cities are growing. Demonstrating this, built-up areas in the world cover an estimated 4.75 million km<sup>2</sup>, and the spread of urban areas is growing at a rate of approximately 20–40,000 km<sup>2</sup> each year. In Australia, three quarters of the population live in major cities (defined by the Commonwealth Government's Major Cities Unit as settlements of at least 100,000 people). According to Davis (2005), this rapid urban growth signifies a new epoch for the planet; for the first time in history, more people live in cities than rural areas. This poses significant challenges and opportunities for ensuring national and international food security, and such circumstances are exacerbated in the context of climate change.

According to renowned food writer Julian Cribb urban expansion is occurring almost entirely on the world's best farmland. However, he also notes that it is not only cities that consume farmland, but the 'pleasant but nutritionally unproductive' recreational pursuits such as golf courses and theme parks enjoyed by city dwellers in peri-urban areas (Cribb, 2008, p. 58). Australia's urbanization is also associated with growing dependence on centralized or integrated infrastructure to deliver power, water and waste management services and on increasingly complex distribution networks, although there is increasing recognition of the merits of decentralised systems (e.g. Cook et al., 2009).

While cities grow and expand their footprint, they are also inextricably linked to climate change, both as the generators of significant proportions of greenhouse gas emissions and as places substantially impacted by current and future changes to climates. The capacity of cities to secure the range of resources, including food, necessary for their continued existence in the face of significant climate change remains the subject of extensive research and policy debate (e.g. Australian Government, 2010).

In this review, we critically examine the intersections between Australia's growing urbanisation, the need to respond to climate change and the prospects of and challenges for ensuring greater food security.

Historically, towns and cities have been places that have offered greater security (including food security) and opportunity than other places, which have typically been much smaller settlements in rural areas. Security and opportunity are products, primarily, of scale and density. Larger numbers of people, living closer together found it easier to defend themselves against external threats and also to provide each other with individual and social services. Recent work by Glaeser (2011) and Saunders (2010) and others has highlighted the contemporary benefits of cities and urban life, especially to migrants from rural areas. Urban scale and density also, perhaps paradoxically, provide opportunities for processes of radical social and political change as well as for security and continuity. It is no coincidence that the various uprisings of the so-called Arab Spring have occurred in the cities of Egypt, Libya, Syria and Tunisia.

But cities also, and at the same time, create threats to individual and social security: diseases can spread more rapidly in densely populated areas; natural and human-made disasters can have more devastating effects in such areas, and urban populations become more dependent on broad scale systems of production, distribution and consumption. Rural populations are not necessarily any less vulnerable overall to disease and disaster than urban populations, but the nature and scale of their vulnerability is often profoundly different.

Urban populations derive their relative security and opportunity from more extensive and complex social and urban systems, but at the same time these can be sources of vulnerability. Food security is a case in point. The relationship between food production and urbanisation is both profound and long standing and as Mumford (1961) observed, the foundations of urbanism lie in Neolithic period when the domestication of plants and

animals allowed previously nomadic peoples to 'put down roots' and build settlements (Bartling, 2012). In ideal typical terms, we might contrast urban and rural systems: in rural areas (or perhaps rural systems in developing countries) food production is driven primarily by self-sufficiency, with systems of exchange and distribution developing only when the basic needs of the household have been met and surpluses exist. In urban areas (especially in developed countries) food production is often a commercial operation with most people consuming food produced mostly by others. Furthermore, significant amounts of food production takes place outside or beyond the urban areas, and indeed a significant proportion of food consumed by urban residents is now grown at great distance from where it is processed and consumed.

However, the production of food within cities also has a long history, and there are signs that it is growing in significance. Yet to date there has been little research, especially in the Australian context, into the extent of domestic and urban food based production (see for example Larder, Lyons and Woolcock, forthcoming). Its significance lies not just in its contribution to the supply of nutrition, but also in its wider social impacts: enabling food growers to re-connect with 'nature', re-establishing seasonal sensibilities and connections between food and place, and providing new opportunities for social interaction and community development. Some argue it also allows new (or in fact older but often forgotten) forms of social enterprise to be showcased and practised.

The growing significance of food and food security can be seen in a number of contemporary policy developments, including the Senate Enquiry into Food Security in 2010, the PMSEIC report on Australia and Food Security in a Changing World (2010) and the National Food Plan, currently being prepared by the Australian Department of Agriculture, Fisheries and Forestry. Each of these developments signifies the political importance of the agricultural sector in the national accounts, a growing emphasis on new forms of food production, processing and supply in state plans and the emergence of urban agriculture as a matter of local policy concern. Furthermore, global threats such as peak oil, climate change and economic and financial crises also have clear connections with food security at both the global and the local scales.

In mid-2011 the National Climate Change Adaptation Research Facility (NCCARF) issued a call under its Synthesis and Integrative Research Program for proposals in a modular project looking at ensuring secure food supplies for Australia under climate change. This call focussed mainly on food supplied by large scale agricultural production in rural areas and its international trade, but it did invite proposals on alternative projects consistent with this theme.

A team of researchers from Griffith University, the University of Queensland and Macquarie University submitted an alternative proposal which focussed on *urban* food security and the role of *urban* agriculture in the face of climate change. Following some minor amendments, this was approved and this review constitutes an initial output of the project.

The project takes the form primarily of a critical review of published material related to the topic, but this will be supplemented by data collected in face-to-face interviews and group discussions in two locations, the city of the Gold Coast in Queensland and parts of Melbourne, Victoria. This review is structured around seven key questions related to urban food security, urban resilience and climate change. It will be supplemented by subsequent reports of the fieldwork undertaken in Melbourne and the Gold Coast and by a synthesis report to be published by NCCARF later in 2012.

## Review methods

This stage of the research consists of a review of contemporary scholarly and policy literature that focuses on food security, urban agriculture and urban resilience. It is concerned also with the actual and anticipated impacts of climate change on these elements and with the potential to improve policy and practice in the future.

The review also reflects themes that were explored in field work conducted in Melbourne and the Gold Coast, including interviews with a wide range of local policy makers and practitioners in which issues emerging from the literature were explored in greater detail and with a local focus.

While literature reviews have been a standard feature of scholarly research for many years, in the last two decades there has been pronounced improvement in the rigour with which many have been undertaken. The rise of the so-called evidence-based policy movement saw increasing attention paid to the quality of evidence brought to bear in policy debates and to the more systematic synthesis of all relevant and available evidence in a given field. The approaches developed by the Cochrane Collaboration (in the field of health care) and its sibling, the Campbell Collaboration (in the broad field of social policy) provide a robust framework for identifying the best available research on a given topic, and synthesising the results into a format most useful to policy development and evaluation. The rigorous criteria applied to the conduct of Campbell Reviews of social policy issues and interventions provide a benchmark for this review, but given a number of limitations on the time and resources available to us we were not able to meet all of the Campbell review criteria. Nevertheless, we have incorporated as many of their principles as possible in this review.

The focus of our review was on the nature (and definitions) of urban food security and urban agriculture, historical patterns of urban agriculture in Australian cities and elsewhere, the anticipated and actual impacts of climate change on urban agricultural practices and factors that might inhibit or promote more extensive urban agricultural practices in the future.

We limited our review to material published in English, since 1990, in academic and policy or practitioner journals and excluded material published in the popular media. We also focussed primarily on studies of cities in Australia and other developed countries, although some definitional material based on countries of the global south was included. While studies were not screened for research design or methodology, the majority could be described as narrative or conceptual rather than empirical studies based on any form of experimental design. Nevertheless, a small but significant number of empirical case studies now exist and have been included, and these appear to be a growing in the totality of studies of urban food security. Given the paucity of empirical studies, no attempt was made to combine data sets and carry out any form of meta-analysis of larger data sets.

A long list of material conforming to these broad criteria on the basis of title and abstract was then reviewed for relevance and a shorter list constructed. This material was then allocated (non-exclusively) to seven thematic groups for more detailed analysis. The approach, findings and conclusions were then summarised and finally incorporated into this draft review. Not all of the material listed in the consolidated bibliography is referred to directly in the review.

We will continue to add to the database of relevant material and to adjust our own conclusions accordingly, until the end of this project. We also welcome suggestions of any other relevant material that has not been included in the review.

The seven themes used in the review were used also to structure a set of interviews with a sample of key players in urban agriculture policy and practice in Melbourne and the Gold Coast. These interviews provided the opportunity to explore in more detail the practical implications of some of our interim conclusions and have been followed up with a further round of interviews in the case study areas before the completion of the project. The findings from this fieldwork will be reported separately.

## Literature review findings

### 1. What do we mean by food security in general and urban food security in particular?

There is broad consensus that one of the major issues confronting society into the future is food security – a term that is widely used in policy circles (see for example Lawrence, Lyons and Wallington, 2010). In Australia, the Prime Minister's Science, Engineering and Innovation Council (PMSEIC) 'Expert Working Group' draw upon the UN Food and Agriculture Organisation's definition, that:

*Food security is achieved when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet dietary needs and food preferences for an active and healthy life (PMSEIC, 2011).*

Food security was first introduced as a concept in the 1970s, and as articulated above, refers primarily to access, affordability and availability (Patel, 2007). While definitions of food security have shifted over time, an emphasis on the market, technological innovation and increasing productivity remain enduring narratives underpinning food security discourse.

It is important to note there is also a range of related terms that seek to engage with similar issues. Food sovereignty was introduced by the International Farmers' Organisation – *La Via Campesina* in 1996 as a necessary precursor for food security (Patel 2009). While there is a diversity of understandings, at the heart of food sovereignty movements is a 'rights-based approach'. In the groundbreaking *International Assessment of Agricultural Knowledge, Science and Technology for Development*, food sovereignty is defined as 'the right of peoples and sovereign states to democratically determine their own agricultural and food policies' (McIntyre, et al., 2009, p. 111). More than simply access (as articulated by food security advocates) food sovereignty seeks to make transparent the power relationships inherent in agriculture and food systems.

Whilst there is general agreement around the definition of food security (and its counterpart, food sovereignty) – indeed the FAO definition is widely used and cited – there is significant contestation around the scale and causes of food insecurity and the responses required to ensure adequate food access for the global population.

#### *The Spatiality of Food Insecurity*

Many view food insecurity as a local-level, issue. For instance, Gregory et al. (2005) state that food insecurity can be experienced at various spatial scales, from the individual and household level through the regional to the global. There is clear policy discourse often health-focussed which tends to identify disadvantaged and marginalised groups at the individual, household and community level as being vulnerable to food insecurity (see Browne, Lurance and Thorpe, 2009; Burns, 2004 and Temple 2006). These approaches often reflect the jurisdictional boundaries of policy makers, such as local government, thus confining interventions to the local level,

despite many of the causes of food insecurity deriving from global level issues. Whilst this local approach might be considered a 'band-aid' solution to global food insecurity, it does have the potential to bring more immediate relief to those who do not have secure and consistent access to healthy food. Indeed, there is mounting evidence showing that despite Australia's status as a wealthy nation, with rising costs of living, food tends to be the only flexible element in many household budgets. A survey by the Victorian Government's health department reported:

*Large numbers of Australians are affected by 'food insecurity', which means they experience irregular access to safe, nutritionally adequate, culturally acceptable food from non-emergency sources. In 2008 about 1 in 20 people surveyed in the Victorian Population Health Survey had run out of food at least once in the last 12 months and had been unable to afford to purchase additional food. People on low incomes, single parents, indigenous communities, people with chronic illnesses or disabilities, refugees and people living in remote or isolated areas are especially vulnerable (Vic Health, 2011:9).*

In Australia, obesity has also become a major health issue, and one that has been linked to food insecurity:

*In the longer term, food insecurity can lead to becoming overweight or obese, particularly in women. While it seems paradoxical that food insecurity is linked to unhealthy weight, these health issues arise because foods of poorer quality with high fat, salt and/or sugar content are the lowest cost options, whereas diets based on lean meats, whole grains and fresh vegetables and fruits are more costly (Browne, Laurance and Thorpe, 2009).*

Certainly, problems of food are manifest at the local level, and as the research findings noted above demonstrate, there are often gendered dimensions to such problems. However, the responses to food insecurity developed at and for this local scale often favour more individualised, and often gender insensitive interventions such as education about nutrition. Whilst having an important role in promotion of better diets and nutrition awareness, these responses can overlook the macro-level and structural causes of the problem of food insecurity.

#### *Macro-level causes of food insecurity*

Moving from the local to the global scale, many complex issues converge in what has been referred to as a 'perfect storm', rendering global food supply chains more insecure. Some have observed the irony of a global food crisis when record levels of hunger in 2008 also coincided with record harvests and profits of major agrifood corporations (Holt-Gimenez, Patel and Shattuck, 2009). From a critical political economy perspective, food insecurity is a symptom of broader social inequalities, poverty, land dispossession and corporate control of the food supply chain (Holt-Gimenez, Patel and Shattuck, 2009). In addition, this broader, 'food systems' approach acknowledges the systemic issues affecting the food supply chain. These include urban encroachment into prime agriculture lands (Condon et al., 2010), environmental degradation and population growth as systemic problems that will affect more than the poor and vulnerable groups (Lawrence, Richards and Lyons, 2012). Further, the enrolment of food producing land into the bio-fuel economy (McMichael, 2009), and excessive financial speculation in land and other agricultural commodities has also pushed up the cost of food (Lawrence, Richards and Lyons, 2012).

Despite evidence that there is currently enough food for all to be food secure, almost a billion people globally are considered food insecure, and over one billion people are obese (Patel, 2008). These figures point to the rift in the distribution of food, something

that has been linked to power in the food supply chain being concentrated in multinational corporations and driven by the imperatives and preferences of western nations. Concerns have also been raised about the waste of food in the developed world, with estimates that one third of all food produced is discarded (Gustavson et al., 2011). Research into supermarket dominated supply chains reveals a system of private 'quality' standards whereby fresh food is rejected on the basis of cosmetic appearance (Richards, Lawrence and Burch, 2011). In Australia, the Coles/Woolworths duopoly controls around 80% of the fresh food retail market (ACCC, 2008), leaving few alternative outlets for fresh food that does not meet their stringent standards on appearance rather than nutritional quality or seasonality.

Another complexity to this issue of food supply and availability is climate change and extreme weather events – as was experienced recently in Australia with floods, cyclones and fires destroying food crops and food distribution points such as the Brisbane wholesale markets. Coupled with this, the monoculture approach to agricultural production also increases vulnerability by placing all of the 'eggs in one basket' – as was experienced when cyclones Larry and Yasi wiped out much of the national banana crop in north Queensland in 2006 and 2011 respectively.

The macro level causes of micro level food insecurity are evident in the Federal Government's report on food security:

*Australia's growing population, estimated to be 35 million in 2050, and growing per capita consumption (e.g. wheat consumption per capita has increased 55 per cent since the 1970s) will also present a challenge for domestic food security given the potential for increasing climate shocks and dwindling international stockpiles of commodities' (PMSEIC, 2011:17).*

Less discussed at higher policy levels are the consequences of peak oil and the current reliance of global agrifood systems on oil for fertiliser manufacture, food processing and long distance food distribution. Whereas many community groups (including the national Transition Towns movement) have cited peak oil as one of the key reasons to re-localise the food system, to date, such calls have not been taken up in any systematic way by national or regional governments, perhaps with the exception of Cuba, when it was subject to US trade and import sanctions and received less support from Russia following the collapse of the Soviet Union.

### *Responses to food insecurity*

Despite claims that there is an adequate supply of food to feed the world, there is an alternative discourse that presents the causes of global hunger and food insecurity to be the result of inadequate food supplies for a growing global population. For proponents of this perspective, this leads to a call to increase the amount of food grown, through biological and chemical innovations such as genetic engineering and synthetic fertilisers. Although unpopular with many in civil society, this viewpoint has been embraced with some fervour in Australia, especially since the drive since the end of World War Two to raise agricultural production for export to global markets. Within the food security discourse, this approach rests on an assumption that increases in the volume of food produced will result in less people experiencing hunger. This ideology of scientific-driven productivism, although often critiqued, is commonly heard in Australian policy circles (Lawrence, Richards and Lyons, 2012). For instance, the foreword of the Federal Government's policy document on food security states, 'global food security will demand the development and delivery of new technologies to increase food production on limited arable land and without relying on increased water and fertiliser use' (PMSEIC, 2010: v). More controversially, in 2009, during the opening address of a think tank on Agricultural Productivity and Climate Change, the president of the Australian Academy of Science offered the following:

*...by 2050... food production will have to double on possibly about half the arable land available...will the unfounded reluctance to embrace the genetic modification of food crops retard the necessary research that is required to yield productive crops in a changing climate environment?’ (Australian Academy of Science, 2010:16).*

The Australian Government’s scientific body, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) is also concerned with global food security, making the following statement on their website: ‘The global challenge will be to increase food production through raising agricultural productivity efficiently, whilst decreasing our environmental footprint’ (CSIRO, 2010). The CSIRO has been a major proponent of GM food, partnering with industry to invest in research and development of GM crops. Whilst environmental sustainability is clearly a component of government policy responses to food security, the social dimensions, such as global power relations, poverty, inequality and the negative aspects of the corporatisation of the global food system are glaringly absent (Schanbacher, 2010).

The policy dominance of this technological framing at the Federal policy level leaves little opportunity to critique the broader causes of food inequality at the scale where this would be most appropriate. Somewhat ironically, the detrimental effects of the chemical-based techno-fixes from the post war era onwards are now being used to promote genetically modified food crops – based on claims that genetically modified plants can be engineered to resist pests, hence reducing the volume of chemical inputs needed to grow food. Importantly, and in the context of climate change, a number of agri-chemical and seed companies, including Monsanto, are in the midst of commercialising a number of ‘Climate Ready’ crop varieties, which will, according to their promoters, be designed to better withstand the vagaries of climate change, including increased salinity and drought. Whilst such innovations have been largely viewed by the scientific community as offering a silver-bullet to the problem of food production, it has the potential to replace chemical pollution with biological pollution in the form of genetically modified organisms, something that has alarmed many due to its irreversibility and potential effects on wider ecosystems. The urgency with which this argument is mounted also relegates concerns of environmental and health impacts of the GM approach to food security behind somewhat dubious claim that GM can ‘feed the world’. However, this approach further concentrates the control of the food system into the hands of fewer and fewer corporations, which in itself has been cited as a major cause of food insecurity. Framing the issue as a problem for science to solve marginalises attempts to question the problem of wealth and food distribution globally. It may well be that science holds some of the answers to a food secure future, however, these should be augmented with a world view that understands and incorporates ‘the social’ into a critical and holistic view of food security.

This critical and holistic approach argues for a reconceptualisation of food security into food sovereignty, as outlined above. The food sovereignty approach addresses not only the availability of and access to food, but also raises questions about the ownership and control of food systems, criticising the increasingly concentrated corporate ownership of food production, distribution and retail as well as of biological material such as seeds. The food sovereignty approach also advocates placing greater control of food production among a wider range of institutions including community-based and not-for-profit organisations.

Development agencies including those of the United Nations, have long-observed that the increased production of food using chemical fertilisers and pesticides and GM seeds, does not necessarily result in a reduction in hunger worldwide, or to universal food security. Recently, the UN Special Rapporteur on the right to food, Olivier De Schutter, proffered a food sovereignty approach to food security by identifying peasant-



driven agro-ecology (rather than corporate-driven agribusiness) as the most appropriate mode of production to secure the right to food for vulnerable groups, especially in developing countries (United Nations, 2010). In addition, agro-ecology was also identified by De Schutter as a mode of production that accrues benefits in relation to increased productivity at the field level, the reduction of rural poverty, improved nutrition, climate change adaption and the better dissemination of agricultural 'best practices'.

### *Food security in urban settings*

As mentioned in the introduction, more than half of the world's population now lives in cities. This urban population has, arguably, not only become increasingly disconnected from the origins of food, but is also reliant on an increasingly globalised economy of monetary exchange to access food. Vulnerabilities are exacerbated when economic resources are low, and when food grown outside of the city is compromised due to climatic variability and extreme weather events. Feeding growing city populations requires transporting food from outside of its perimeters, sometimes from agricultural regions outside of the city, but increasingly from distant lands beyond the referential frame of the recipient. Dixon (2011) refers to this disconnection between people and the origins of their food as a metabolic rift, a disconnection and vulnerability that was also highlighted during this project's fieldwork in Melbourne and the Gold Coast.

Urban agriculture can also be seen as part of a food sovereignty movement, where people take control of some of their calorific needs by producing food in their backyards and community gardens and develop informal food distribution systems such as food swaps, or gleaning. In this respect they are not only reacting to concerns about the availability of food, but also to its inputs. There is evidence that urban citizens are increasingly concerned about the health and environmental implications of an industrial food system, its reliance on chemical inputs and the recent push toward GM food.

In response to growing awareness of food vulnerability many urban citizens have begun develop new approaches to local food production and distribution, exploring innovative methods of urban agriculture and re-applying methods and practices that were once commonplace in cities. In some local jurisdictions this has been augmented by local and regional state support which has resulted in new partnerships with local community groups. In towns and cities appropriate planning policies can help re-insert food growing into city life by extending the opportunities for groups in civil society to engage in food growing (Burke, 2009).

There is great potential for urban agriculture to play a bigger part in dealing with food insecurity. Kortright and Wakefield (2011) report that globally, around 600 million people are engaged informally in urban agriculture. With Havana seen as a model for urban food production with an estimated 90% of the fresh fruit and vegetables consumed in the city being grown in and around the city and despite differences in the social, political and economic context, this Cuban experience offers valuable lessons for urban food production in Australian cities

## 2. How is food security (in general and in cities) likely to be impacted by climate change?

The effects of climate change are likely to exacerbate a range of existing problems with food supply. These include the problem of food security and food colonisation generally for example. Morgan & Sonnino (2010) have coined the phrase 'the new food equation' to describe the constellation of complex new developments that have obliged politicians and planners to treat food policy more seriously. This constellation includes the food price surge of 2007/08 which led to a sharp rise in global food insecurity. This contributed to the current position of food security as a matter of national security and may be leading to new forms of 'food colonialism' (Morgan & Sonnino, 2009:210) whereby cash rich but food poor countries systematically buy up the productive capacity of poorer countries. Rapid urbanisation in many countries is also raising concerns about the resilience of urban food supply chains. While the effects of more variable rainfall patterns, more very hot days, more severe storms and changing patterns of vector borne diseases are likely to have profound effects on traditional agricultural practices, they will also affect urban agriculture.

One of the most significant reviews of food security in Australia is included in the recent report from the Prime Minister's Science, Engineering and Innovation Council (PMSEIC, 2010), entitled Australian and Food Security in a Changing World. This notes that climate change will have a number of direct impacts on food production as a result of changing patterns of rainfall, more very hot days and soil erosion. But here are also likely to be significant indirect effects such as disruptions to supply lines as a result of floods, cyclones and more very hot days.

*Australian agriculture is highly dependent on the climate and its variability: Australia is indeed 'a land of droughts and flooding rains'. Climate affects almost every aspect of food production: the plants and animals used, average production and production variability, product quality, what areas are farmed, what soil types are preferred, the management systems and technologies used, input costs, product prices and natural resource management. It, therefore, follows that if the climate changes, many aspects of food production will change too (PMSEIC, 2010:12).*

And these anticipated impacts are likely to be, on balance, negative rather than positive although there may be new opportunities in a changed environment.

*... the predicted environmental changes associated with climate change are expected to have an overall negative effect on agricultural production with serious crop declines in some countries (PMSEIC, 2010:21).*

These negative impacts are varied:

*Climate change will considerably alter the productivity of arable land. As rainfall retreats to the coast and inland temperatures rise, the effective rainfall in currently productive areas will be lowered quickly. Areas currently cropped to produce grain will become increasingly marginal and be turned over to extensive grazing. Such areas are often characterised by low soil nutrients and unable to sustain grazing systems without fertiliser input. Although climate change may increase the proportion of marginal arable land due to reduced effective rainfall, land degradation processes such as salinity and acidification may slow, as these are driven by profile water movement. The decreased biomass production, however, significantly increases erosion risks associated with reduced vegetative cover, resulting in dust storms and silted dams. Land use conflicts are likely to*

*become more acute in the future. Already population and development pressures in coastal peri-urban areas have resulted in the loss of arable land to housing and industry. The coastal peri-urban zone is predicted to become increasingly valuable as rainfall patterns retreat to the coast. As coastal cities expand into productive and arable areas, viable block sizes for potential horticultural production are reduced to high value parcels of land for housing. As development proceeds, neighbouring viable and productive parcels of land come under increasing pressure to cease traditional farming methods (p. 29).*

These conclusions are echoed by de Zeeuw & Dubbeling (2009) in their review of global trends. They suggest that because of their high dependency on food bought rather than food grown by themselves, urban consumers are likely to become increasingly vulnerable to a number of global threats. And, of course, the urban poor will be most exposed and vulnerable to these new threats:

*Inevitably, the effects of climate change will hit hardest on the urban poor, since they are often located in the most vulnerable parts of the cities and have the lowest capacity to adapt to such changes (de Zeeuw & Dubbeling, 2009, p. 5).*

However, rural populations will not be unaffected:

*City economies will suffer as agricultural production in the surrounding countryside is hit by storms, floods or water scarcity. The decline in agricultural productivity will thus not only effect the rural population but also the urban poor (de Zeeuw & Dubbeling, 2009, p. 10).*

Gregory et al.(2005) usefully broaden their consideration of security from a preoccupation with food availability to issues of access and utilisation, or what is often referred to as a 'food systems' approach:

*Much climatic change/agricultural research has been focussed on assessing the sensitivity of various attributes of crop systems (land suitability, crop yields, pest regimes) to specified changes in climate. These partial assessments most often consider climate change in isolation, focus on bio-physical aspects of production, and provide little insight into the food accessibility and food utilisation dimensions of food security. (Gregory et al., 2005 p. 2143)*

Instead they propose a concern also with the capacity of other systems to cope with new threats and challenges,

*The vulnerability of food systems is not determined by the nature and magnitude of environmental stress per se, but by the combination of the societal capacity to cope with, and/or recover from environmental change, coupled with the degree of exposure to stress. (Gregory et al., 2005, p. 2143)*

and:

*... climate change is only one of several changes affecting food systems and that its relative importance varies both between regions and between different societal groups within a region. Adaptations of food systems via interventions in availability, access and utilisation are possible to cope with climate change at different scales although their feedbacks to the earth system have yet to be fully assessed (Gregory et al., 2005, p. 2147)*

Overall, there is a tendency in some of the literature to make broad statements about the likely impacts of climate change on food security in general and perhaps even on

the food security of cities, but not to describe more detailed studies of local impacts in specific places. These studies are beginning to emerge and to contribute to the accumulation of valuable knowledge that is both general and specific, but there is room for further research.

It is likely that without a concerted effort to collate these local studies and to learn lessons of research design and effective methods, the field will continue to be characterised by an unhelpful degree of ignorance and fragmentation. We should not expect a high degree of uniformity in research design and approach as few fields are able in practice to impose a strong set of paradigmatic assumptions on individual researchers, but there is scope for overcome fragmentation through collation and synthesis.

### **3. What do we mean by urban agriculture?**

Historically, urban agriculture has made a significant contribution towards feeding Australia's growing city populations. Especially during wartime, urban and backyard food production was encouraged as a way of supporting the war effort (Gaynor, 2006). In contemporary times, urban food production takes multiple forms, and while figures are difficult to accurately gauge, (rates of reporting are likely to be under-estimates and/or out of date – see Yeatman, 2008), there are some indicative indicators of its growth. Firstly, data from the Australian Bureau of Statistics collected in 1992 (the most recent survey of home food production) found that over a third of the population produced food in domestic spaces. More recently, in 2010, the Australian City Farms and Community Gardens Network listed at least 212 community gardens, while the Australian Farmers Market Association provided a list of 149 farmers markets (though not all are located in urban locations). There are also numerous community supported agriculture (CSA) and food swap schemes, as well as hundreds of edible school gardens, including the well-renowned 'Stephanie Alexander Kitchen School Garden', founded in 2001. There are also active 'permablitz' communities in the capital of every state and territory in Australia. Permablitzing – a hybridization of permaculture and the 'Backyard Blitz' phenomenon – involves communities coming together to transform backyards, abandoned blocks and other spaces into edible landscapes, or as one permablitz activist described it: 'eating the suburbs, one backyard at a time'. 'Guerrilla gardening' is also gaining increasing national attention, including its increased popularisation via a commercial television program where the stars 'fight the filth with forks and flowers'. The arsenal of guerrilla gardeners includes 'weapons of mass re-vegetation'; referring to seed guns or seed bombs made of clay, organic compost, local native seeds and water, that are then tossed into neglected spaces to germinate.

Despite the continued existence and indeed expansion of a wide range of food production activities in cities, as Pires (2011) notes, the very notion of urban agriculture is seen by some as a contradiction in terms – agriculture being something that happens beyond cities in rural areas. Bartling (2012) traces the ways in which developing post-war urban culture (especially in the USA) celebrated the proliferation of consumption over production and presented a set of practices and behaviours that were 'appropriate' for urban and suburban life. Increasingly this defined urban animal husbandry and food production as 'inappropriate' and although there is now clear evidence of a large and growing counter-cultural response to this, the relationships between 'natural' and built environments and between humans and nature continue to influence contemporary urban policy debates, albeit often in subtle ways (Turner, Nakamura & Dinetti, 2004; Register, 2006).

Most definitions of urban agriculture include a variety of activities carried out at many different scales, from the domestic to the city-wide. Although definitions vary to some

extent by region and country, they are increasingly embracing this wider range of activities.

Hodgson et al. (2011) offer one such comprehensive definition:

*Urban agriculture encompasses far more than private and community gardens. It is typically defined as the production of fruits and vegetables, raising of animals, and cultivation of fish for local sale and consumption. A more holistic systems definition acknowledges the connection between urban agriculture and the larger food system, as well its influence and dependence on a variety of economic, environmental, and social resources.*

They note also the other important but less common urban agricultural activities, including:

- institutional and demonstration gardens;
- edible landscaping;
- hobby and commercial bee, poultry and animal keeping;
- urban and peri-urban farms;
- hybrid forms that integrate gardening and farming.

The other dimensions of variability include:

**purpose** – production for personal consumption, educational purposes, donation or sale; neighbourhood revitalisation or local economic development; healing or therapeutic purposes; sale or donation;

**location** – on private land (gardens, yards and balconies); public or community managed land; residential or industrial areas; peri-urban land zoned for rural enterprises; road verges and nature strips; rooftops; walls;

**size and scale** – large contiguous parcels of land through to balconies and windowsills;

**production techniques** – in soil and raised bed cultivation; greenhouses; hydroponic & aquaponic venues; aquaculture sites (ponds, rivers, canals, ocean); indoor and outdoor animal rearing; and,

**end products** – plants and animals/animal products for consumption; plants for ornamental, medicinal and therapeutic use; re-usable waste products (compost) environmental or ecological services; social capital (Hodgson et al., 2011).

De Zeeuw (2004) claims that urban agriculture can be usefully distinguished from its rural counterpart because it is ‘...integrated into the urban economic and ecological system’. According to this view, urban agriculture uses resources such as urban water, organic urban waste and even local urban labour in ways that are not common in rural agriculture. This contrast does not appear to hold strongly for Australia, except perhaps in the sense that rural agriculture sometimes experiences shortages of local labour and relies on the attraction of workers from elsewhere, including from beyond Australia. The use of local water via storage and irrigation systems is also commonplace in the food growing rural regions of Australia, although the definition of ‘local’ in relation to capturing and using river water can be politically contentious. There is perhaps less re-use of waste products in large scale and industrialised food production, indeed there is a growing critique of the breaking of previously virtuous systems in beef production by the introduction of corn feed lots (Pollan, 2007). However, it may be the case that small scale agricultural activities involving self-provisioning and barter, carried out on small parcels of land are in fact much more common in cities than in the countryside.

While some see the density of development and the price of land in urban areas as a serious impediment to the extension of urban agriculture, the benefits of proximity and the fact that a wide range of urban agricultural activities are possible on very small parcels of land, suggest that cities may in fact be very well suited to these activities (de Zeeuw & Waibel, 2000).

Mougeot (2000) argued forcefully for bringing urban agriculture to its 'conceptual maturity' so that it is better able to help us both understand it as an activity and press for greater intervention to support it:

*Whether we agree or not with the phenomenon, the expression 'urban agriculture' (UA), or 'intra- and peri-UA', originally used only by scholars and the media, has now been adopted by UN agencies such as the UNDP. [...] This makes our need to define it self-evident, at least for our short- and mid-term governance.*

Mougeot's approach is to integrate various conceptual building blocks for a more comprehensive definition of urban agriculture: the types of economic activity involved; the categories of food and non-food items produced; the locations where it is practised; the relations between urban and peri-urban systems; the nature of production systems; the scale of production; and product destinations.

Similar to the definition of Hodgson et al., as above, this leads Mougeot to offer this more comprehensive and consistent definition:

*Urban agriculture is an industry located within or on the fringe of a town, a city or a metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-)using largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area.*

While defining the nature and practices of urban agriculture are important, this task should not obscure the related need to consider its role in developing more secure food systems in our cities and how this might be affected by climate change.

The next section reviews the contribution of urban agriculture to broader conceptions of urban food security.

#### **4. How might urban agriculture contribute to greater food security?**

In this section we review the possible and actual contribution of urban agriculture, broadly defined, to improving food security in cities. While the focus of the question is on Australian cities, much of the available literature relates to other cities of the world or to cities in general.

There are few studies that attempt to systematically measure the impact of any urban agricultural activity in broad terms or in relation to food security. Indeed, as Burns (2004) notes:

*Currently, there are no known systematic reviews of the effectiveness of community food security interventions [...] There have been a small number of non-systematic reviews of community food security interventions conducted and these have identified the need for more rigorous evaluation and the importance of highlighting the process issues in program implementation. (Burns, 2004, p. 4).*

However, urban agriculture is widely held (Browne et al., 2009; Condon et al., 2010; PMSEIC, 2010; Brown & Carter, 2003; de Zeeuw & Dubbeling, 2009; Havaligi, 2009; Burns et al., 2010) to offer a number of benefits to broad conceptions of food security. Among the most commonplace manifestations are community gardens, run by

community groups, churches or schools and often with the support of local governments. Browne et al., (2009) describe a number of their benefits:

*Community gardens increase access to fresh fruit and vegetables, particularly for participants, and provide opportunities for physical activity, community pride and social interaction through gardening. (Browne et al., p. 12)*

while:

*The value of school based gardens is that learning about gardening, composting, healthy eating and cooking can be integrated into the school curriculum in a positive and practical way (Browne et al., p. 12).*

They also describe the long established practice of municipal allotments in the UK, where small plots of land are leased very cheaply to local residents so that they can grow their own produce. In these settings communal activities may occur but are not an expectation or requirement of the lease, which typically requires only that the plot is kept free from invasive weeds.

PMSEIC (2010) acknowledges the range of benefits and motivations for urban food production:

*There is evidence that the increased production of food in urban environments is in response to heightened awareness of the environmental impacts of food production, food transport costs and the costs of inputs such as energy and water. The urban production of food can have a range of social, environmental and health benefits that address issues of food security. These include increasing the consumption of fresh foods, developing and strengthening communities, providing culturally appropriate foods and increasing awareness of food production systems (PMSEIC, 2010, p. 44).*

Urban agriculture is seen in this view to be both a response to greater public awareness of the quality and price of fresh locally grown food, and as a means of raising awareness even further.

Brown's (2002) analysis of urban agriculture in cities of the USA expands on this multi-faceted view of the benefits:

*Urban farming is an essential tool that addresses a number of these problems in innovative ways. Environmental stewardship is enhanced through urban agriculture's efforts to green cities. Economic development and community revitalisation are also achieved through urban farming when neighbourhoods take new pride in a community garden, when inner-city residents gain the ability to grow and market their own food, when inner-city farmers' markets provide new opportunities for entrepreneurs and commercial farmers. Individual health and a sense of empowerment and well-being are created when urban dwellers have access to local food and greater control over their own food system. Urban farming takes account of the real cost of food, and the real benefits from local and regional food. (Brown, 2002, p. 6)*

Brown also points to the importance of seeing urban agriculture in a wider metropolitan context that includes activities in the peri-urban fringes as well as within the city proper:

*The full scope of urban agriculture appears if the city is seen in its relationships to the urban fringe and the surrounding region. Urban dwellers want local supplies of food to remain healthful, abundant, and accessible. This is far easier to do*

*when suppliers, distributors, and consumers have the opportunity for more direct local relationships, as with urban and peri-urban agricultural endeavours that provide farm-fresh foods through community-supported agriculture, farmers' markets, restaurants, and educational and other institutions. (Brown, 2002, p. 10)*

However, while urban agriculture brings clear benefits, Smith et al., (forthcoming) argue that these benefits are spread unevenly. In their extensive mapping of 'communities of food production' in Madison, Wisconsin they show that gardening for food is strongly correlated with home ownership and salary levels. Indeed areas of lower socio-economic status which are therefore more likely to face food insecurity show less intense levels of urban food cultivation.

The economic significance of urban agriculture is widely recognised; in the United States it is believed to account for 40% of total food produced, and on 10% of the total land given over to agriculture. More broadly, Armar-Klemesu (2000) estimates that 15–20% of the world's food is produced in urban areas. More specifically, urban farmers are known to provide fresh produce at reasonable cost in the poorer parts of American cities where mainstream supermarkets often find it unprofitable to locate.

de Zeeuw and Dubbeling (2009) note the specific dietary benefits of eating more fresh food and of countering '...the urban trend of eating more processed, high sodium foods' (de Zeeuw and Dubbeling, 2009, p. 14). They also refer to the growing phenomenon of the 'the urbanization of poverty' (p. 7) as more people move from rural areas to new and expanding cities and experience food insecurity. However, it is worth noting also that a strong argument is made that most rural to urban moves lead to higher living standards and less poverty (Glaeser, 2011).

Their list of the benefits covers a wide range of factors:

*Urban agriculture improves access of the urban poor to fresh and nutritious food not just by making it available at close proximity to cities but also by reducing the costs of food (since locally-produced food involves less intermediaries and less transport, cold storage, processing and packaging). Marketing chains in urban agriculture are normally much shorter and more varied than in rural agriculture, reducing the costs of wholesalers and retailers in the total chain; transport costs are lower, while more products are sold fresh and unpackaged soon after harvest, thus reducing related storage, packaging and cooling costs. (p. 16)*

The diversification of food sources within cities and reducing dependency on food imports (whether from elsewhere in a large state like Queensland, inter-state or internationally) are also taken to be beneficial for cities in general and for the most vulnerable who live in cities. The opportunity to work in new urban agricultural enterprises can provide a valuable safety net in times of economic crisis and natural disaster.

Finally, de Zeeuw & Dubbeling identify the opportunity for urban agricultural activities to make productive use of urban wastewater in irrigation as well as managing urban stormwater in more sustainable ways. Keeping parts of cities permeable to rainwater and free from conventional forms of development can also perform valuable flood mitigation and storage functions.

The social and transformative capacity of urban agriculture is described by Havaligi (2009) as part of a 'multi-pronged tool' for climate change adaptation and mitigation:

Urban Agriculture is important for its productive acreage but it is more important from the perspective of *transforming urban dwellers from being consumers into a community of co-producers*. By participating in UA, people can develop a deeper understanding for food and respect for the farmers who dedicate their



lives to growing it. By networking with local farms in 150 mile radius cities can become resilient, powerful by being locally adapted to the regional food system. Cities can move towards zero waste goals by using UA to utilize the organic fertility generated by the city. The 'waste' will be captured and kept within the regional system in form of carrying capacity of the region. Urban Agriculture is also an economic and social tool which in very simple ways will provide employment opportunities, opportunities for social networking and working together as a community. It will reduce the carbon footprint of city dwellers and decrease their dependence on fossil fuels (Havaligi, 2009, p. 15, emphasis added).

Dietary benefits are recognised by Kortright & Wakefield (2011) in their study of edible backyards:

*The most significant impact of home food gardening on food security found was its ability to enhance the accessibility and nutritional value of the diets of the gardeners interviewed. Although affordability of food was not a key issue, having a garden allowed respondents a greater diversity of fresh and nutritious produce than they might purchase otherwise. This is an important benefit of food gardening for all households, regardless of income level. The process of everyday engagement with food gardens also changed the gardeners' approach to food. It is likely that all of the gardeners improved the sustainability and environmental impact of their diet, another key element of community food security, by growing at least some of their food at home, entirely outside the industrial food system (Kortright & Wakefield, 2011, p. 51)*

However, these benefits are more individual than social:

*Food gardening is immediate and personal, forcing us to deal not only with what and how much we eat but also where it comes from and what it means to us. Home food growing can contribute to community food security not only by helping to address issues of nutrition and access but also by improving the sustainability, health, and well-being of individuals and families. The increased level of self-reliance and of food system knowledge seen among research participants both provide important supports to community food security. However, the individualised nature of much of the home gardening seen here suggests that home gardening does not, in and of itself, contribute to community development (p. 51).*

The significance of the wider social and political aspects of urban agriculture is recognised by Dixon et al. (2007) in their comparison of urban food systems of Melbourne, Nairobi and Bangkok in terms of diet and healthy equity. They argue that over-consumption is the inevitable outcome of a system where food consumers are far removed both physically and culturally from the source of their food.

*In the post-industrial country context, unequal access to dietary diversity has been characterized as a slow food–fast food binary. In this scenario, the wealthy consume diverse diets of unprocessed and local foods sourced from specialist providores, city farmers markets, and wholefood cafes and restaurants, whereas the majority rely on industrial and processed foods of varying nutritional quality sourced from supermarkets, fast food chains, and cafes that use short-order cooks to heat and serve mass-produced food. (Dixon et al., 2007, p. 15–16)*

They also make a case for state intervention in ensuring that urban agriculture can play

a more prominent role in enhancing urban food security:

*Feeding city populations equitably cannot be left to market forces alone, but requires government and civil society-aided intersectoral approaches involving agriculture, urban planning, small business, and health sectors. Such approaches must acknowledge complex webs of causation between global and national policies favouring industrialisation and private equity, the elimination of food-producing habitats, transformations in food retail, consumer poverty, ignorance, and anxiety (Dixon et al., 2007, p. 126).*

This theme is developed by Edwards (2011a & b) in arguing that while relatively small scale and modest in comparison with major food producers, processors and suppliers, small local enterprises have the potential to grow and to prefigure the possibilities of alternative forms of production, processing and supply:

*..as a reaction to the vulnerabilities of the dominant neoliberal food system based on industrialisation, privatisation, deregulation, standardisation and commodification, there are a growing number of informal, localised and community-based social practices based around food appearing in Australian cities. (p. 115)*

They also suggest that further research is necessary to determine the long term benefits of these local initiatives.

## **5. What is the extent of urban agriculture in Australian cities?**

As stated earlier in this review, there has been no comprehensive survey of the full range of urban agricultural activities taking place in Australian cities, but many smaller scale and more modest studies exist of some of these practices in particular cities. This section reports on the extent of urban agriculture from both the academic and 'grey' literature and pays particular attention to urban agriculture projects. There is little in the literature that has attempted to quantify the extent of urban agriculture in private backyards or of informal economies around growing and exchange amongst particular social groups. However, it is believed, that many such gardens and social networks do exist in Australian cities as well as in smaller towns and rural areas.

There is some quantifiable information relating to some aspects of urban agriculture, but given the informal and dispersed nature of urban food growing, it is difficult to know the volume of food being grown in Australian urban areas, or indeed, the area of land dedicated to various forms of urban agriculture. For instance, the Stephanie Alexander Kitchen Garden project report having 265 kitchen gardens in schools across Australia (see [www.kitchengardenfoundation.org](http://www.kitchengardenfoundation.org)). Other urban agriculture related data is available from the food rescue organisation, Second Bite. Their website reports on the organisation providing 6.8 million meals across 350 community organisations, or nearly 3.5 million kilograms of food. Whilst this falls into the distribution rather production end of urban agriculture, it highlights the abundance of food being diverted from waste by just one organisation in Australia. Indeed, there are a number of organisations in Australia engaged in food rescue – and in doing so, alleviating food insecurity for a sector of the population whilst also preventing the waste of edible food.

The Australian City Farms and Community gardens network is currently conducting a survey to map community gardens in Australia. Whilst data on the number of community gardens is not yet available, attempts are being made to capture the extent of some of these activities. This coincides with urban food growers' greater use of the internet and other social media such as Twitter, blogging and Facebook, to connect, plan, distribute and share. A prime example of the creative use of social media to network urban growers and foragers can be seen on the 'Sharing Abundance' website

(<http://sharingabundance.org/>). Again, while yet reflected in much scholarly and academic literature, sites such as this offer a valuable window into grass roots community activity that would be otherwise hard to access. Sharing Abundance supports a number of projects, but perhaps the most interesting is the use of an interactive map to identify and locate urban fruit trees that are accessible to the public, and a program that links tree owners with the broader community to share in the harvest when there is a glut of fruit.

In the following section, and again in the absence of an extensive scholarly literature on the extent of urban agriculture in Australia, we draw heavily on the work of Montague (2011), who conducted a comprehensive review of local government and food security on behalf of the Victorian LGA. Her report highlights a number of examples of urban agriculture across Australia. Whilst this does not quantify the amount of food grown or volume of urban land in use for food growing, the report illustrates the wide range of activities currently underway in Australian cities of all sizes, and further, gives some indication of both the scope and the history of urban agriculture. Some of these initiatives reported by Montague (2011: pp.18-20) are reproduced in full next page.

**City of Greater Dandenong:** VicUrban Meridian Development – integrated edible landscape into a new development. Public orchards supported by levy included in each household's rate notice. These funds are managed through the Meridian Homeowners Association and pays for a community and landscape manager to manage maintenance requirements and work with residents to create an activity program to maintain the orchards.

**Moreland City Council:** Ceres Farm and Market in Brunswick has been in operation for over 20 years despite the fact that no zone for commercial agriculture exists.

**Baw Baw Shire:** active by Design Guidelines – new guidelines require that for a sub-division to be considered 'active by design' the people that live there should be able to be able to access community gardens.

**Swan Hill Rural City Council:** as a participating Food for All Council 2005–2010, Swan Hill provided a range of support to the Manatunga Community Garden, an Aboriginal community garden that has been operating for ten years. Council assisted the garden group to apply for federal government grants that then enabled them to install water tanks and a watering system and to purchase fruit trees. Council provided some infrastructure support in the form of framing for a greenhouse, and a barbeque so produce could be cooked on site, and community sessions could occur to engage and involve more participants etc. The garden participants were also encouraged to visit the nearby Robinvale Community Growers Market. This provided an opportunity for the garden to sell any excess produce. The key has been the leadership and consistency of the person involved in running the garden and great patience in building the relationship between the FFA project and the indigenous community.

**Brisbane City Council:** is encouraging urban agriculture and has incorporated it into high level planning documents such as The City Plan. This document, Our shared vision – Living in Brisbane 2026 city-wide outcomes states 'Food in the city: Brisbane is lush with food producing gardens and city farms in parks, schools, backyards, community facilities and businesses.'

**City of Darebin:** supports gardeners in a number of ways: discount prices on compost bin, sustainable gardening workshops; the Backyard Harvest Festival Program, and a number of publications around sustainable and seasonal gardening.

**Maribyrnong City Council:** has supported community gardens in a number of ways; supporting the development of a Community Garden Network; establishing a

community gardens webpage on the Council website; using its small grants program to support the development of community gardens for particular cultural groups (through the their local church or support agency); resourcing garden development in low cost housing sites; supporting existing communal gardens in low income areas.

**Brimbank City Council:** has supported an annual Tomato Project since 2008. This project involves the provision of thousands of tomato seedlings to residents as well as a series of workshops in neighbourhood houses on how to grow tomatoes (planting, staking, fertilising, harvesting) and how to cook using tomatoes, a series of garden open days, tomato related art projects and even the crowning of a King and Queen of Tomato Growing in Brimbank. Community volunteers are involved as tomato growing gurus and Iramoo, a local sustainable community garden centre in St Albans supported by Victoria University, plays a key role in supplying seedlings and providing advice and training.

**Byron and Tweed Shire Councils:** are delivering the 'Sustainable Streets' program that aims to foster community-inspired sustainable behaviour change at a street-by-street level. The program consists of regular neighbourhood gatherings and sustainability education workshops on topics, including:

- local food production;
- bush-friendly gardening;
- rainwater harvesting;
- solar power and energy efficiency;
- ethical shopping; and,
- green cleaning.

Montague (2011:24–26) also reports on the following initiatives:

**Food Connect:** a Brisbane based organisation operating on Community Supported Agriculture principles in Adelaide, Sydney and Brisbane. Food Connect sources seasonal food from local farmers (also home & community gardens, school farmers and gleaners – people who harvest fruit growing in public space like street or park fruit trees). This is delivered to the Food Connect Homestead each week by the farmers and small freight companies. It is packed into various sizes of fruit and veggie boxes. The boxes are delivered to a network of City Cousins (families, schools or community centres) and subscribers collect their boxes from their local City Cousin and get the chance to meet like-minded neighbours for a chat. Food Connect also organises regular farm tours to connect city folk with growers.

**Robinvale Community Growers' Market:** as part of the VicHealth Food for All Program, Swan Hill Rural City Council worked to establish a monthly growers market in Robinvale a community with a significant proportion of low income residents in insecure housing. Many of the local growers were also struggling financially at the time due to drought conditions and stringent contractual conditions with the big buyers. It took several years of consistent financial and practical work to build the market into an on-going business that benefitted both growers and local residents.

**Outer Suburban/Interface Services and Development Committee 2010:** an inquiry into sustainable development of agribusiness in outer suburban Melbourne 2010 gives detailed discussion of agribusiness and green wedge issues affecting interface councils several of which are in the NWMR (Hume, Wyndham, Melton, Nillumbik and Whittlesea.).

**Municipal Strategic Statements:** that include a commitment to support the preservation of agricultural and food producing land in the municipality: Casey, Wyndham, Swan Hill and Moorabool Councils have all done this.

**Bacchus Marsh Horticultural Area:** the Moorabool Council resisted pressure from developers to rezone prime food growing areas for sub-division and urban development.

**Landshare Australia:** brings together people who have a passion for home-grown food, connecting those who have land to share with those who need land for cultivating food. The concept of Landshare began in the UK in 2009 and has since grown into a thriving community of more than 57,000 growers, sharers and helpers across the country.

**Northern Rivers Food Links:** is a collaborative partnership between seven Northern Rivers Councils and Rous Water that aims to secure a sustainable food future for the region. The Partnership has a budget of \$1,899,080 to implement a range of initiatives during 2010 and 2011 including:

- village showcase projects;
- marketing and education;
- distribution projects;
- food production and distribution in Indigenous communities project;
- sustainable agriculture projects;
- a local government resource kit <http://www.northernriversfoodlinks.com.au/>.

**Penrith Food Project:** is one of the longest established food security projects in Australia with the goal of 'increasing and improving the supply of affordable, acceptable, nutritious and safe food to residents and workers in the Penrith LGA, with particular concern for disadvantaged groups'. The Penrith Food Project includes (among others) the objectives of conserving high quality agricultural land and increasing local production of food. Over the last ten plus years the project has also influenced the development of a number of other food policy projects and networks in NSW including the Sydney Fresh Food Bowl Network; Hawkesbury Food Program; and Hawkesbury Harvest.

**Hawkesbury Harvest:** is described in Budge & Slade 2009, pp. 50–52. Hawkesbury Harvest was established as an incorporated organisation in 2000 covering three local government areas (including Hawkesbury). Its strategic goals are: business and industry engagement in agribusiness – promotion and communications, product development, advertising, merchandising, regional branding, income generation, industry members, education and support.

While many of these initiatives have been established in recent years, some were formed decades ago. The oldest community garden in Perth (APACE) was established in 1987 in one of the poorer parts of Fremantle, to serve the needs of recent migrants and those without gardens of their own. The Centre for Education and Research in Environmental Strategies (CERES) in Melbourne is not only well known, but has also been in existence for many years, and demonstrates vividly the opportunities for integrating a wide range of educative and productive activities. Given issues of climate change, food security and the growth of urban areas, there is clearly a need for a more

comprehensive description of the capacity for food production in Australian cities. This might be difficult to attain given the grass roots level action, the dispersed and informal nature food production and distribution and the variety of activities, organisations and networks that constitute Australian urban agriculture.

## **6. What are the impacts of urban agriculture, in Australian cities or elsewhere?**

Just as there are relatively few comprehensive surveys of the extent of urban agriculture in Australian cities, so too is there a paucity of studies of its effects and impacts. There are, however, numerous descriptive accounts of various urban agricultural practices in various cities around the world that provide something of a foundation.

For example, de Zeeuw (2004) cites a study of Hanoi in which 80% of fresh vegetables, 50% of pork, poultry and fresh water fish, and 40% of eggs originate from within the city itself and its peri-urban hinterland. In Shanghai, 60% of the city's vegetables, 100% of its milk, 90% of eggs consumed and 50% of pork and poultry meat is supplied by its urban and peri-urban farms and small scale plots. While in both cases these patterns of local food supply reflect farming traditions that have not yet been subsumed by large scale commercial agri-business, they also show the potential for cities that are very large by Australian standards to achieve comparatively high levels of local food supply and hence bolster their food security.

Studies of cities in Africa, also cited in de Zeeuw, have estimated that urban vegetable farmers can achieve returns of between two and five times the average wage rates of hired labourers, while in the Republic of Congo incomes from market gardening are two to five times the estimated subsistence income. A study commissioned by the World Bank found some significant differences in the income levels of urban food producers and others in cities of the developing world, suggesting a clear benefit to them as well as the systematic benefits of supplying locally grown food.

More studies rely on general perceptions of the benefits of urban agriculture. Lovell (2010) for example studied community gardens in US cities and concluded that '...the social value of urban green space is not negligible.' and claimed that community gardens can '...improve psychological well-being and social relations [and] facilitate healing' (p. 22). This may be true but very few studies are designed to measure with any degree of empirical precision these claims, which often remain as statements of the possible.

Some more empirical impact studies are emerging in Australia. Ghosh (2011) has estimated the potential contribution of suburban home garden food production and suggests they could produce between 800-1100kg of produce per annum; enough to meet a typical household's requirements for fresh vegetables and produce a small surplus of fruit. In a similar vein, Francis (quoted in Ghosh, p. 2) claims that:

*The lawn space of the suburbs, if put into intensive food production has the potential to out-produce the yields of commercial agriculture previously practiced on that land and provide most of our fresh food needs.*

Edwards (2011) reports not only the growth of urban agriculture in Melbourne, Victoria, but also some of the impacts, particularly in relation to community building, the promotion of healthy diets and the creation of new spaces for people with mental health problems and disabilities. These positive impacts extend beyond those of food security and highlight the many advantages, of urban agriculture, including building greater resilience among urban populations. Shelton and Frieser (2009) study identifies the positive impacts of urban agriculture on the Sunshine Coast in Queensland,

highlighting the heavy dependence of the current food system on fossil fuels, which creates vulnerabilities in the face of a pending 'peak oil' crisis and rising fuel costs. Local food systems that are decentralised and less complex are claimed to be a more robust model for this region that will help mitigate the effects of peak oil and adapt to climate change, whilst the production of more staple foods within the urban footprint can help alleviate food shortages in times of transport crisis or other disruptions to the distribution system.

The positive impacts of urban agriculture clearly extend beyond the production of food. For instance, Corkey (2004) found that a community garden at Sydney's Waterloo Public Housing Estate presented a wide range of benefits to residents, including social and cultural expression, community building and informal education about social and environmental sustainability. These characteristics might be considered to be some of the key ingredients of greater community resilience if society is to respond to some of the predicted 'global shocks' associated with peak oil and climate change. This again highlights the complexity of urban agriculture and the impact that collaborative efforts in community food growing can have on society and the environment beyond the calorific and nutritional benefits obtained from locally-grown food.

Clearly it is not especially easy to design and carry out empirical studies of the impact of urban agriculture. Like the evaluation of many social practices in complex systems it is difficult and costly to collect robust and reliable data, especially over the long periods of time that would enable important questions of cumulative benefit and longevity to be answered. Isolating the specific factors that might contribute to greater urban food security, to greater social well-being and to improvements in public health are notoriously difficult but now is perhaps the time to begin these studies if the claims of urban agriculture are to be properly tested.

## **7. What are the barriers to the more widespread adoption of urban agriculture in Australian cities?**

In this section we review studies, as well as drawing on some insights from our empirical data collection, of the various ways in which urban agriculture is regulated, by planning and other regimes. We begin with some broad studies of the relationships between urban planning and food planning and move on to more focussed studies of particular urban agricultural practices and how these are dealt with by planning regimes.

Little now happens in cities of the developed world, including Australian cities, that is not subject in some way to regulation by the institutions of government or by legislation. Buildings cannot be erected, land uses changed, commercial activities undertaken, social activities carried out on public land without obtaining the requisite permit, approval or licence. And if the necessary approval has not been granted (and sometimes even if it has) the relevant authority will invariably be contacted by a disgruntled citizen.

When Australian cities grew in the 19<sup>th</sup> century the taken for granted rights of property owners included the right to cultivate their own property and to keep an assortment of animals for food. Since then a range of concerns, primarily about public health, neighbourliness and local amenity have presaged the introduction of a complex web of regulations that limit the scope and practices of urban agriculture.

While the regulations driven by public health concerns are typically implemented and enforced by local government officials, probably the most influential regulators of urban agriculture have been planners (whether called urban planners, town planners, environmental planners or city planners).

In both the developed and developing world, urban planners have for many years treated agricultural activities as something at least to be regulated and in some cases to be positively discouraged in urban and even suburban areas. As Morgan (2009: p. 344) notes:

*Paradoxically, urban planners in Africa have been part of the problem of food insecurity because, until recently, they saw it as their professional duty to rid the city of urban agriculture. The rationale for ridding the city of urban farmers and street food vendors varied from country to country, but it was often animated by a combination of sound concerns about public health and less than sound notions of urban modernity.*

We might note also that in many cities in the developed world, urban agriculture is sometimes seen as incompatible with contemporary visions of the desirable city, although this is now changing in many contemporary debates about the nature of sustainable, liveable and resilient cities in the face of global challenges such as peak oil and climate change.

Morgan (2009: p. 341) suggests therefore that:

*...for the foreseeable future, food planning looks set to become an important and legitimate part of the planning agenda in developed and developing countries alike.*

However, as Howe (2003: p. 255) notes, '[scholarly] research has tended to bypass or perhaps even ignore food that is grown within urban areas and the land-use policy implications of such activities.' In his survey of metropolitan planning authorities in the UK, Howe found that almost half of the responding planners described their awareness of issues of food production in urban areas to be low, while the ways in which these issues were incorporated into land use plans focussed typically on the environmental, rather than the social or economic aspects, of urban agriculture. This suggests the wide range of activities that exist under the broad heading of urban agriculture tend to be seen, by the planning system at least, as a somewhat marginal activity rather than sitting '...right at the heart of debates concerning the sustainable city and those related to urban containment versus expansionism' (Howe, 2003: p. 257).

Of course debates about the relationship between planning and food security are not new. Peter Self's influential book, *Cities in Flood* (1957) devoted a chapter to 'food versus homes' and to a critique of British planning policy at that time which sought to preserve agricultural land seemingly at any cost, in the name of food security. While 'atomic war' rather than climate change was the greatest existential threat of the time, he drew on recent war time experience to imagine that in times of emergency and threatened starvation, '...every inch of garden would be tilled, playing fields would be ploughed up, road verges would be cultivated. But under conditions in which food distribution - to put it mildly- might be interrupted, families would perhaps prefer to have a little fresh food on their doorstep than to rely on getting it from some 'optimum' place of production ' (Self, 1957:114–115). He noted also the intimate connections between planning and food, captured in post-war Labour government's declaration that 'to safeguard agricultural land to the greatest possible extent is one of the Department's (of Town and Country Planning) main objects and on taking office, the Conservative Government still more emphatically gave the same aims as *the principle reason for continuing planning controls*' (p. 107, emphasis added).

In Queensland, the first State Planning Policy to be published in 2012 relates to the 'protection of Queensland's Strategic Cropping Land', although for the purposes of this review it is worth noting that this policy does not apply to any strategic cropping land in an urban area or within the urban footprint.



Morgan (2009) introduces a special issue of *International Planning Studies* devoted to the topic of 'feeding the city: the challenge of urban food planning' by noting the American Planning Association's observation that food planning has been a 'puzzling omission' in urban planning theory and practice until recently, mainly because it is seen typically as a rural issue and hence beyond the scope of the urban policy agenda. He argues against this perception on the basis that 'food systems' are inextricably linked to and affected by a host of other urban policy concerns such as public health, social justice, economic development and resource management and while urban agriculture may have faded from cities of the global north, it has always been a major activity in cities of the south.

While there is no obvious consensus around what 'food planning' means or who 'food planners' are, there are signs that food policy debates are slowly being opened up to new elements and concerns. No longer seen as purely a matter of rural agriculture, practiced by an increasingly corporatised body of farmers and agri-businesses, new concerns for public health, social justice and ecological integrity have entered food policy debates in general, led by advocates of urban agriculture.

Morgan concludes (2009: p. 347):

*Feeding the city in a sustainable fashion – that is to say, in way that is economically efficient, socially just and ecologically sound - is one of the quintessential challenges of the twenty-first century and it will not be met without a greater political commitment to urban food planning and a bolder vision for the city.*

Increasingly, comprehensive urban and metropolitan plans are acknowledging that spatial planning and land use regulation are tools for achieving cities that are more liveable, sustainable, prosperous, resilient and just. The nature of these plans is therefore changing, with greater emphasis being given to the ends as well as the means of planning. Nevertheless, we should remember that one of the foundational texts of the modern planning movement, Ebenezer Howard's *Garden Cities of Tomorrow*, first published in 1898, included the 'agricultural estate' as an essential element of an economically viable Garden City as well as the opportunity for domestic production by each householder.

As one of the most commonplace urban agricultural activities, community gardening has been the subject of a number of studies of both impact and potential impact. In their study of community gardeners in Perth, Evers and Hodgson (2011) stress the importance of locating community garden initiatives within broader alternative food networks. These have emerged in response to growing dissatisfaction with the mainstream offerings of supermarkets, a desire to consume more locally grown produce and a preference for smaller scale and locally owned enterprises. Nevertheless, they warn also of the perils of 'defensive localism' (p. 589) in which an uncritical assumption is made that anything that is produced locally is good and conversely that anything imported (certainly from another country) is not so good or even bad. Morgan (2010: p. 345) argues instead for a more judicious combination of locally-produced seasonal food with fairly traded global products in what he calls 'a cosmopolitan conception of sustainability'.

Evers and Hodgson note the importance of government intervention in support of urban agriculture:

*In order for urban agriculture to thrive, it must also be supported by local and state governments: one of the reasons for the disappearance of dairies and market gardens from the Australian urban fabric has been changes in land use planning (2011: p. 590).*

Their review notes a significant increase in the number of community gardens in Perth in recent years (from 14 to 40) and attributes this to the support and encouragement offered by a project, Growing Communities WA, which was supported financially by a range of partners including the City of Swan, the Town of Cambridge and Lotterywest. This time limited project directly supported a number of community gardens, provided advice and other resources to others and carried out research on the extent and impacts of gardens across the state. It is superseded by the WA Community Garden Network, which as well as providing limited ongoing support, is also working to attract the resources necessary to provide more extensive and secure support in the future. This illustrates a perennial problem for those working to advance the cause and the practice of urban agriculture: a lack of long term and secure funding. Of course this is not the only sector that experiences this problem, indeed it is endemic to the voluntary and community sector as a whole, but it suggests that without long term support from one or more level of government practical initiatives will remain fragile and strategic planning notable by its absence.

These more general findings related to urban agriculture in Western Australia also appear to be mirrored in the Gold Coast, one of our fieldwork case study areas. In the last 18 months, and in response to the problems in food supply and distribution as a consequence of the Queensland floods of January 2011, the Gold Coast City Council has expressed growing interest in support for urban agriculture. Urban agriculture, it is increasingly recognised, may help overcome some of the vulnerabilities associated with complex commodity chains and centralised distribution hubs. Specifically, the Gold Coast City Council has provided funding assistance to expand the number of community gardens and is planning a study of the yields possible from intensively farmed urban plots. Yet despite this type of initiative, local growers cite a range of problems associated with the planning and regulation of community gardens, high costs of insurance and other compliance requirements.

More broadly, Morgan and Sonnino's (2010) analysis of the London Food Strategy (LFS) demonstrates some of the other resource challenges associated with urban agriculture. Here, and even in what is undeniably a world city and with the whole-hearted support of the Mayor of London, the resources committed to the implementation of the LFS were substantially less than those required to realise its objectives.

Lovell's (2010) review of multi-functional urban agriculture in cities of the United States recognises that:

*One of the greatest constraints on the widespread adoption of urban agriculture is the limited access to land for those who would like to grow food, and the lack of secure tenure on that land (p. 2511).*

She goes on to argue that publicly-owned open space offers an important opportunity to redress this constraint, but more importantly to '...integrate urban agriculture directly into the planning of green infrastructure in cities' (p. 2511). This requires a number of considerations, including:

- market connections;
- transportation systems;
- resource availability;
- waste disposal systems.

Lovell argues also that for urban planners to be able to argue persuasively for greater emphasis on urban agriculture in their plans, further research evidence is needed to demonstrate the value of ecosystem services flowing from urban agricultural land uses.

This would strengthen the case for supporting urban agricultural uses in the face of competition from other uses, especially those within the broad category of public open space. Such findings are also backed by insights from our research participants. It has been observed in many cities that the conversion of even a small proportion of existing public open space to more food productive uses would make a substantial and significant contribution to meeting the demand for urban agricultural land.

Pothukuchi & Kaufman (1999, 2000) have done much to stimulate scholarly debate about the place of food systems on urban agenda. They note the piecemeal approach to planning for the food system at the urban scale, and suggest four reasons why it is a relatively low visibility activity among planners and in the popular urban consciousness:

1. Urban residents tend to take the food system for granted and unless they have experienced serious disruptions to food supply chains, show little concern with food security as an issue of metropolitan scale supply;
2. The historical development of cities has typically seen a separation of urban and rural problems. Urban policy typically responds to problems of housing, employment, transport and crime and rarely considers food policy, which is a rural issue;
3. Major policy making institutions, such as the US Department of Housing and Urban Development (HUD) and the USA Department of Agriculture (USDA) have few connections or shared policy agendas, even if their policies both have profound impacts on cities; and,
4. The mechanisation and industrialisation of farming has obscured the impact of suburban encroachment of peri-urban farmland. As they say, '...the loss of local farmland that historically served cities went unnoticed in local grocery stores.' (Pothukuchi & Kaufman 2000, p. 214).

Nevertheless, attempts to limit the loss of peri-urban farmland (or potential farmland) through the application of planning policies – such as the definition of an urban footprint – is not immune from criticism. As Condon et al. (2009) observe:

*The strategy of relying exclusively on this regulatory tool to ensure land is available for food production and to provide a buffer between agricultural and urban lands has significant limitations, is politically polarising, and fails to advance regional food security or food sovereignty (p. 113).*

## Conclusions

There is growing concern about the vulnerability of our growing cities to a number of factors, including peak oil, global economic crises and climate change. Each of these is likely to have profound effects on the security of urban food supplies. Recent disasters, especially floods, have highlighted the fragility of food supply lines in Australian cities. Experience in the rapidly growing cities of the global south provides vivid illustrations of the damaging consequences for social order and civility if food security is seriously compromised in anything but the very short term.

Food security is typically defined in terms of access to food as well as to its affordability and availability. Other related concepts are also used increasingly in policy and other debates, including food sovereignty, which promote a rights based approach to the ownership and control of food systems.

As more of the world's population lives in cities, questions of food security and food sovereignty increasingly take on an urban dimension. While much debate is concerned with how to produce enough food for a growing urban population and how to secure

lines of supply from often rural places of production to urban places of consumption, greater attention is now also being paid to the production of food within urban areas.

The production of food within urban areas is an important component of urban agriculture, along with systems of food processing, distribution and sale. The management of waste from these processes is also an important element in this broad conception of urban agriculture.

There is scope, therefore, for urban agriculture to make an important contribution to urban food security. This can in turn help build urban resilience and sustainable forms of urban life. However, to maximise its contribution and impact, urban agriculture must be integrated into broader food systems and into more comprehensive programs of metropolitan planning for resilience and sustainability. But food policy is rarely connected with other policy fields and if it is to become more influential it must become more integrated with other elements of urban policy.

While the urban poor clearly experience all too intensely the effects of food insecurity and have limited means to overcome these effects, food insecurity affects all urban residents to some extent. While relatively wealthy urban residents may be better able than their poorer neighbours to afford to buy healthy and nutritious food they will nevertheless be similarly affected by major disruptions to urban food supplies.

Anticipated climate change is likely to lead to more extreme weather events which are the main source of these major disruptions to urban food supplies. Moreover, the viability and productivity of existing food production systems is also likely to be seriously compromised by local manifestations of climate change.

Urban agriculture has the potential, therefore, to contribute to the adaptations that all cities are engaged in if they are to be more resilient in the face a variety of existential threats, including climate change. Insofar as it represents a form of localised food production and consumption that requires fewer energy inputs than more spatially extensive and energy intensive forms, it also has the potential to help mitigate the factors causing climate change.

While there are few (if any) studies to date that have attempted quantify the potential of urban agriculture to make cities more food secure, there are many which catalogue its social and community benefits. These include the development of stronger social connections in urban communities, increased awareness of the benefits of fresh fruit and vegetables and locally produced food in a healthy diet, greater appreciation of the sources of food and of the connections between processes of food preparation and food quality. Urban agriculture also has the potential to re-establish connections between food and place that were once common in Australian cities, but which have to a great extent withered over the last four decades. All of these social impacts may be as significant as the nutritional benefits of urban agriculture.

The increasingly complex systems of regulation that operate within Australian cities, especially those relating to land use planning, health and safety and the operation of small businesses, often serve to thwart attempts to develop and grow new forms of urban agriculture. While this may not be the intention of such regulatory regimes, they can nevertheless inhibit unnecessarily these new enterprises.

Urban agriculture represents, therefore, an important opportunity for cities to adapt in the face of climate change. It is unlikely that the major cities of Australia will ever become completely self-sufficient in food, but through greater support for urban agriculture they are likely to become more food secure. This in turn will contribute to the overall resilience of Australian cities and to their sustainable growth in the future.

## **APPENDIX 2: URBAN FOOD SECURITY, URBAN RESILIENCE AND CLIMATE CHANGE: A REPORT ON FIELDWORK IN MELBOURNE AND THE GOLD COAST**

**September 2012**

## 1 Introduction

Cities have always been dependent on a variety of resources not only for their survival, but also to enable them to serve as places of innovation and civilisation. As those who in the past laid siege to cities knew all too well, one of the most important of these resources is food. Over the course of the last century cities have been supplied with their food from an increasingly wide range, indeed most Australian cities are now supplied with food from many different parts of the world as well as from different parts of Australia (Gaballa and Abraham 2008).

In Australia, food security has not been a major political issue, but there is evidence that in a relatively food secure country, some people do have limited access to the food needed for a healthy diet. Conservative estimates indicate that food insecurity in Australia reaches at least 5% of the general population (Temple 2008). In more urbanised areas of the country this rate could be higher (Nolan, Rikard-Bell et al. 2006).

Australia may be a 'land of droughts and flooding rains' and Australian food production is highly dependent on the climate and its variability. Indeed, agriculture is one of the sectors of the economy most vulnerable to climate change (Padgham, 2009) and almost all aspects of it are likely to be impacted: from the plants and animals being cultivated, the amount and quality of the product, which areas can be farmed, which soil types are preferred, the management systems and technologies used, input costs, product prices and natural resource management (PMSEIC, 2010: p. 12).

Consequently, food production in Australia is likely to be significantly affected by climate change and recent estimates suggest that 'climate change is predicted to reduce food production in Australia by over 15%' (PMSEIC, 2010: p. 28). In addition to these direct impacts on food production, climate change may also impact wider food systems through market change, increased food prices and disruptions to supply chain infrastructure (Gregory et al., 2005).

In response to actual and anticipated threats to the supply of food to cities, and in light of emerging threats from climate change, and other external crises peak, political instability, oil, financial crises), attention has focussed in recent years on the potential to supply a greater proportion of the food requirements of cities by producing, processing and marketing more food locally, either within or close by the city in question. In this sense urban food security and urban agriculture have been seen as increasingly and inextricably connected.

It is increasingly recognised that a variety of practices that exist under the broad heading of 'urban agriculture' can make small but significant contributions to ensuring more secure food supplies for urban Australians. These practices range from backyard and rooftop gardening, through community gardening and composting schemes, to the planting of edible landscapes and the establishment of new food retailing opportunities. Around many cities peri-urban areas have also offered significant opportunities for more localised food production and processing, although these are increasingly compromised by the pressures of urbanisation. There are also significant barriers to the development and wider application of these practices. While some of these barriers

may be biophysical and driven by climatic changes, many are social, economic and political.

This project was designed to extend our knowledge of the current diversity of urban agricultural practices in Australian cities, to identify the social, economic and political barriers to urban agriculture and to explore the potential for extending its practice in the future, especially one increasingly affected by climate change. It draws on a systematic review (presented as Appendix One) of current practice in Australia and beyond and supplements this with two case studies of major Australian cities, Melbourne and Gold Coast, involving interviews with key local stakeholders with knowledge of current urban agricultural practices, barriers and limits. The systematic literature review was undertaken prior to the case study research and the themes used to structure the review were used also to structure the fieldwork interviews. This Appendix presents a summary analysis of the case study fieldwork undertaken in Melbourne and the Gold Coast.

### **1.1 Background to Melbourne and Gold Coast case study areas**

Melbourne is a thriving city of 4 million residents. It is currently experiencing a sustained wave of inward migration at the rate of 70,000 new arrivals per year and its population is projected to reach 7 million by the middle of this century.

Like all Australian cities and virtually all cities established in the 19<sup>th</sup> century or earlier, Melbourne had substantial areas of land within or very close to the city boundaries devoted to market gardening, livestock rearing and fruit orchards. This strong agricultural link was essential to the development of Melbourne, the day to day survival of its population and the operation of its urban economy (Budge, 2009). Market gardens and urban orchards were located in areas that are now high-density inner urban suburbs, such as Brunswick, Coburg, Preston, Northcote, St Kilda, Bentleigh, Moorabbin and Templestowe. These commercial-scale food production activities were complemented by the widespread practice of householders utilising their back gardens to grow vegetables, keep chickens, and larger animals such as goats and cows for milk (Gaynor 2006: 21, *cited in* Burke 2009). Indeed Gaynor reports that in 1881, '40% of households [in Brunswick] owned large livestock and 63% owned poultry (Gaynor 2006: 19, *cited in* Burke 2009). This pattern of relatively self-sufficiency in urban and suburban food self-sufficiency pattern continued through to the middle decades of the twentieth century, and 'helped much of the working class feed themselves through the depressions of the 1890s and the 1920s, as well as the hardships of two World Wars' (Burke 2009: 4).

While peri-urban farming, market-gardening, and backyard self-sufficiency, were undoubted elements within the broader historical narrative of Melbournian, and Australian, urbanisation, the socio-economic and spatial dynamics of urban food systems were transformed by profound technological, economic, planning and cultural change in the decades after World War II. Also during that time, what Budge terms 'the market forces associated with the suburbanisation of metropolitan areas' meant that low-density suburban sprawl and 'big-box' shopping centres – with major supermarkets at their core – became the dominant and preferred model of land use and residential development in major Australian cities like Melbourne (Budge, 2009: 5-6).

Despite some attempts to curb urban sprawl, such as the creation of a strategic and regulatory planning system 'to protect prime growing areas from relentless urban sprawl' by the Melbourne Metropolitan Board of Works in the early 1950s (Budge, 2009: 5-6), or the designation of the 'green wedge' zones on Melbourne's boundaries by the government of Premier Dick Hamer in the late 1970s, the reality was, and still is, that farmers and market gardeners were slowly pushed further out to the fringes of the city and beyond. As has occurred with other major cities on Australia's eastern seaboard, Melbourne's farmland and urban orchards have over time been absorbed within the city's boundaries and built upon. The land has been given over to other uses – residential, commercial and industrial – and the urban farmers and growers have been forced to move further out to the fringes of the expanding city, or have given up this occupation.

Continuing the process of urban expansion, the remaining peri-urban farmland areas of Melbourne are still under threat through recent expansions to the Urban Growth Boundary (UGB), which has now been revised four times since its introduction in 2002. The recent revision in August 2010 included 5000 hectares in the south-east growth corridor, the majority of which was prime market garden land in the Casey-Cardinia shires. Many of these councils have attempted to resist this urban encroachment into the market garden areas on the grounds that it undermines 'their last remaining industry'. They have asked, unsuccessfully, the current Victorian government to reverse some or all of the 2010 decision, by excising market garden land in the Clyde region.

Under this scenario, it seems that local food production in Melbourne is under threat and this could well compromise the food security of the city. However, Melbourne still holds vast areas of land, both in inner and peri urban regions, where food production, processing, distribution and recycling could take place. Urban agriculture has a lot to offer in terms of food security to Melbournians. Roofs, verandas, alleys, avenues and parks could provide significant areas for urban agriculture to flourish and consequently improve Melbourne's resilience to climate change, while strengthening community spirit and fostering education.

The Gold Coast is a coastal city situated in South East Queensland. It is the sixth most populous city in Australia, and the second largest local government area. One of the fastest growing cities in Australia, with a current population of around 500,000 people, it is projected to exceed 780,000 by 2031 (PIFU, 2008).

*The history of the Gold Coast began in the late 1880s when agriculture was brought to the hinterland region and a string of coastal holiday villages quickly emerged. The Gold Coast region grew significantly after the 1920s with the establishment of tourism facilities such as the Surfers Paradise Hotel, and the establishment of the coast as an 'R&R' venue for Australian and Allied armed forces during World War II. The city further developed with the tourism booms of the 1950s and 80s to become one of Australia's top tourist destinations. (GCCC, <http://heritage.goldcoast.qld.gov.au/Histories>).*

Unlike Melbourne, and despite this fast pace of growth, the city still has just under half of its footprint (63,678 hectares) covered in native vegetation and the built environment



occupies less than 50% of the city. The Gold Coast also experiences a subtropical climate, with relatively mild winters and humid summers and, although rainfall is more prevalent during the hotter months, the city enjoys precipitation all year round. These climatic qualities coupled with the opportunities offered by large areas of open spaces make the Gold Coast one of Australia's potential hot spots for urban agriculture to flourish and become a significant part of the urban fabric.

## **2 Methodology**

This project was designed to extend our knowledge of the social, economic and political context for urban agriculture in Australia and to explore the potential for extending its practice in the future. It comprised three main elements:

1. A systematic review of existing studies of urban agriculture in Australia and elsewhere, including any studies of the barriers to its extension and of the likely impact of climate change on the patterns and viability of various urban agricultural practices in Australian cities.
2. Case study research in two Australian cities (Melbourne and Gold Coast) exploring the range of urban agriculture practices, including an assessment of its current and future contribution to urban food security in each locality. Each case study involves the collection and analysis of relevant policy material, local studies and a series of one-to-one interviews with key local stakeholders, including researchers, policy makers and practitioners from local and State governments. Melbourne & the Gold Coast were selected because of their innovations in urban agriculture & the opportunity to use existing open space in new ways.
3. An assessment of the extent to which local urban agriculture and food security strategies make a positive contribution to local climate change adaptation strategies.

We describe the case study element in more detail below.

### **2.1 Case study research**

Case study research is commonly used to explore in detail aspects of a particular case that are not amenable to large scale, extensive research methods such as surveys. While not tied to any particular method of data collection and analysis, case studies often combine quantitative and qualitative or extensive and intensive techniques to explore cases in great detail, providing what is often referred to as 'rich-thick' descriptions (Lincoln and Guba, 1985).

Case studies should also be clear cases of something of theoretical significance to the study in question. In this case the case studies are of two Australian cities with rather different urban trajectories and profiles of urban agriculture. Melbourne was declared a city in 1847 (twelve years after its founding) and is now the second largest city in Australia in terms of its metropolitan area, governed by 26 city and five shire councils.

The City of the Gold Coast was approved by the Queensland state government as the name of the local authority in 1959 and the city is now the sixth largest in the country, while the local authority is the second largest after Brisbane. While Melbourne has a long tradition of meeting many of its food needs from within its immediate hinterland,

the Gold Coast remains a city that contains significant agricultural activity across its jurisdiction and where over half of all its land remains undeveloped.

These two cases were selected to reflect these different historical trajectories as well as a different set of local political institutions, as part of our inquiry was to explore the institutional and regulatory environment in which urban agriculture is either helped or hindered and in which various climate adaptation policies help to frame these responses.

In each case study area interviews were conducted with a range of key informants, identified using snowballing techniques. These have been supplemented with documents produced by some of the relevant organisations. While the original intention was to interview approximately 15 key informants in each city, in practice the distribution was more skewed. Due to the comparatively higher level of activity in Melbourne and a shared interest in advancing the practice of urban agriculture it was possible (and to some extent unavoidable) to interview a much larger sample. On the Gold Coast the opposite was the case and the recent elections at state and local government level have produced something of a policy hiatus in advance of the elections and a preoccupation with other policy commitments after them. This has resulted in a number of officers in state and local governments moving to new areas of responsibility and not being available to participate in the study. While this distribution of interviewees between the two case study areas is uneven, we do not believe it undermines the robustness of the two case studies.

## **2.2 Melbourne and Gold Coast case study research methods**

Both case studies relied mainly on semi-structured, in-depth interviews, using a thematic topic guide developed by the research team in February 2012, prior to the first visits to Melbourne and the Gold Coast. A total of 63 individuals have been interviewed to date, the majority (53) in Melbourne, with fewer (10) taking place in the Gold Coast. Most interviews were conducted face to face, two were conducted by telephone. In Melbourne, 43 of these individuals are currently employed by or have direct formal institutional affiliations, with 32 separate organisations, enterprises and community groups represented. The remaining 10 individuals have no formal institutions affiliations – some never had any formal affiliation, and others had left the relevant organisation in the past few years. On the Gold Coast, four interviewees are community gardeners, one is a food policy officer, and four are local growers who also play roles in community agriculture organisations in the city.

Drawing on the desktop literature review, as well as the research's team own knowledge of key region-specific literature, the topic guide was structured around the key research themes of food security, urban agriculture, climate change and urban resilience. There was a particular focus on exploring the nexus amongst these four themes, in order to explore, for example, the ways in which interviewees believed that climate change might impact on urban agriculture; and conversely, how the practices of urban agriculture could contribute to higher levels of climate resilience for Melbourne in the future. Since the interviews were semi-structured, and bearing in mind the diversity of individuals who agreed to participate in the research, the topic guide was not followed rigidly in every interview, however the four main themes were addressed on every occasion.

The length of the interviews ranged from 30 to 90 minutes, with most lasting approximately 60 minutes. The interviews were conducted at a location convenient to the interviewee. In many cases this was at their workplace or home; while in others it was in an external venue such as a café.

A workshop was held in Melbourne in August, to which all those interviewed were invited to take part. The purpose of the workshop, attended by approximately forty interviewees and a number of others keen to attend, was to allow the researchers to present their interim findings and to receive feedback.

The interviews were conducted according to an ethics protocol approved by Griffith University Human Research Ethics Committee. All interviewees were given a project information sheet, describing in straightforward language the aims of the research, its design and the benefits that might flow from it. They were also informed of the way that information they gave and any opinions expressed would be used in the research and assured that they would not be identified in any subsequent publications (including having any direct quotes attributed to them) without their express consent. For that reason, we have adopted a typology of interviewees, set out below, in order to describe the type of interviewee without identifying them individually. We hope this also makes the report easier to read as well as protecting anonymity of these participants.

Potential interviewees were identified via a key informant approach. Using the networks and experience of project team members in both cities, we contacted a small number of individuals who had over a number of years played a leading role in the fields of food security, urban agriculture and sustainable food systems, and sought their recommendations for potential interviewees. Those individuals were then contacted and during the initial round of interviews we asked for their recommendations regarding other potential interviewees.

While we do not claim either to have identified or interviewed all the relevant individuals and organisations in this field in Melbourne and the Gold Coast, we are confident that most of those playing a significant role in local food policy development and practice have been engaged. We believe that the quality and character of the individuals who agreed to participate in this research, and the range of organisations and entities they represent, has enabled us to achieve these goals.

Interviews were recorded, and notes also taken during the interviews. Interview recordings were partially transcribed for preliminary analysis and all were later fully transcribed for use in the subsequent analysis.

As mentioned above, interviewees participated in this research on the understanding that their confidentiality would be protected. We have therefore adopted the following typology of interviewees in order to attribute direct quotes and opinions to them:

- state government employee
- local government employee
- non-government organisation employee
- member of community food organisation
- farmer/grower/market gardener
- independent researcher/consultant/academic

- backyard/community gardener
- not affiliated

### 3 Food Security: perceptions and understanding

There is broad consensus that one of the major issues confronting society now and into the future is food security – a term now widely used in policy circles (see for example Lawrence, Lyons and Wallington, 2010). In Australia, the Prime Minister's Science, Engineering and Innovation Council (PMSEIC) 'Expert Working Group' has drawn upon the UN Food and Agriculture Organisation's definition, which states that:

Food security is achieved when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet dietary needs and food preferences for an active and healthy life (PMSEIC, 2010).

The understanding from PMSEIC is that food security is a phenomenon characterised by five different but interrelated components, including:

- *Availability* – 'sufficient supply of food for all people at all times';
- *Accessibility* – 'physical and economic access to food at all times – equality of access';
- *Acceptability* – 'access to culturally acceptable food which is produced and obtained in ways that do not compromise people's dignity, self-respect or human rights';
- *Adequacy* – 'access to food that is nutritious, safe and produced in environmentally sustainable ways';
- *Stability* – 'reliability of food supply', as influenced for example by urban sprawl, continual supply of agricultural inputs, climate change impacts, and 'weed, disease and pest incursions' (PMSEIC, 2010:9).

In this sense, food security, which was introduced as a concept in the 1970s, refers primarily to the access, affordability and availability of food (Patel, 2007). While definitions of food security have shifted over time, an emphasis on the market, technological innovation and increasing productivity remain as important elements in most narratives of food security.

However, it is important to note that there is a counter-discourse, which critiques and challenges this 'productivist-technicist' narrative. This counter-discourse expands the food security arguments with concepts and terms such as food justice, food democracy and food sovereignty. Food sovereignty, for example, was introduced by the international farmers' organisation La Via Campesina in 1996 as a necessary precursor for food security (Patel, 2009). While there is a diversity of understandings, at the heart of food sovereignty movements is a 'rights-based approach', where people and sovereign states have the right to determine their own agricultural and food policies (McIntyre, et al., 2009). More than simply about access, food sovereignty seeks to make transparent the power relationships inherent in agriculture and food systems as a precursor to changing these into more equitable systems.

This counter-discourse both engages with the global political-economy of food, and proposes an alternative of more localised and regionalised food systems, with a more even distribution of ownership of and access to productive resources. It also seeks to

shift the focus back to individual and community-level health and well-being, and to include questions of environmental sustainability and resilience.

As mentioned earlier, more than half of the world's population now lives in cities. This urban population has, arguably, not only become increasingly disconnected from the origins of food, but is also reliant on an increasingly globalised economy of monetary exchange to access food. Vulnerabilities are exacerbated when economic resources are low, and when supplies of food grown outside of cities are compromised due to climatic variability and extreme weather events. Feeding growing city populations requires transporting food from outside its boundaries and increasingly from regions about which the consumers know very little, although this applies to many goods consumed by contemporary city dwellers. Dixon (2011) refers to this disconnection between people and the origins of their food as a metabolic rift, a disconnection and vulnerability that was also highlighted during this project's fieldwork in Melbourne and the Gold Coast.

Research undertaken for this project revealed differing perceptions of food security. At national and state government levels, food security is currently treated more as an opportunity rather than a problem. With the understanding that Australia exports a great proportion of its agricultural production (roughly two thirds), the challenge of global food security has been reframed as an opportunity for Australian agri-business and manufacturing sectors, to become, as the Prime Minister put it recently, the 'food bowl of Asia'. This view was echoed by the Victorian Government's Minister for Agriculture and Food Security, Peter Walsh, who in May 2012 called on the Victorian farmers to double food production by 2030 in order to meet 'growing global demand for food and fibre'. These optimistic and opportunistic views reinforce the impression that at the federal and state levels, domestic food security is not a concern.

This attitude by government agencies towards domestic food security was made clear to the research team by individuals with knowledge of the Victorian Department of Primary Industries:

*[There] is a growing group of traditional economists sitting within the research arms of DPI, orthodox, economic rationalists. They have a lot of power [and] have been responsible for poo-pooing concepts like food miles, or small farms versus big farms... They've no interest in urban agriculture, and are going out of their way to actively disparage it. Any food growing that's not large-scale, commercial production oriented to export, is [for them] largely a waste of time [State government employee, Melbourne].*

The macro and global view to food security adopted by state governments was shared by another interviewee who has carried out extensive research on the topic.

*In [Victoria], [food security] is talked about in terms of global-level food security, not state-level food security. It's talked about to justify the continuation of intensive farming in order to 'feed the world'... It really is purely about [production and] supply. It doesn't include any sustainability elements, it doesn't include any social justice elements, and it doesn't include any community or household-level food security elements [Academic researcher, Melbourne].*

Conversely, the semi-autonomous state government agency VicHealth has been a significant institutional driver for mainstreaming food security at the policy and project

level in local government. VicHealth made a major strategic intervention in this field with the launch in 2005 of *Food for All*, which adopted the FAO's definition of food security, with the added element that individuals should not have to depend on emergency food sources in order to gain access to adequate amounts of food. As one of the managers associated with the *Food for All* project described:

*From the VicHealth perspective, food security is more about inclusiveness, social connectedness. The understanding is of having secure access for all to adequate amounts of culturally appropriate and safe food, and not from emergency sources. Regular food to stay well, good quality food, from regular sources, not from food banks and soup kitchens [VicHealth Former Employee, Melbourne].*

The emphasis on non-emergency sources is important because many people within the Victorian Department of Health and in many other government entities frame the problem of food security in terms of the provision of emergency food relief to a very small minority, or only under extreme conditions.

For some 'food security' is to blame for the lack of action and understanding within government. A former VicHealth employee explained that there was considerable resistance to using the term food security:

*They said, nobody knows what that is, you're giving the wrong information. Why don't you call it food tucker, or adequate food, or something like that? People don't like the term 'food security', they think it's to do with terrorism. I firmly believed we needed to keep the term food security, because it's international. If you change it, you can't compare it, you can't use the literature [VicHealth Former Employee, Melbourne].*

This resistance to the term 'food security' was further articulated by another interviewee, with considerable experience working at state and local government levels, suggesting that political reasons prevent food security from being used and debated publicly as it may attract 'unwelcome attention':

*[Politicians] hate the word food security, because it's something that they don't want to have to deal with. They don't like it, because if people are worried about food security, it implies that the governments are not doing their job. It's unwelcome attention [Independent researcher, Melbourne].*

An academic researcher also expressed her views about the terminology of food security used by governmental agencies. She pointed out that the term was being appropriated by the State Government to justify the expansion of a particular form of agriculture and not to improve food security in a holistic sense, thus she justified the need to better define what is meant and expected by food security:

*Terminology is important. As a movement, we need to define better concepts, that are more broadly accessible to people. At the moment, I don't think we...are doing the best job of that...the way we define things is quite important. It's all about how you frame things [Academic researcher].*

Similar comments were made by others in the community sector. Comments such as: 'food security sounds very official, and a lot of people don't relate to that'; or 'food security can put some people off – people understand growing your own, being

healthy, being sustainable, and that's the sort of language we use', reinforce this general trend.

In Queensland, there has been less concerted action around local or municipal food security, however, once again, agriculture is seen primarily as a rural activity, albeit one of the 'four pillars' of the state's economy identified by the recently elected Newman government. There is little evidence that food security is seen as a pressing issue facing cities within the state, although there has been (until recently) some policy attention given to the potential for greater food production in urban and peri-urban settings.

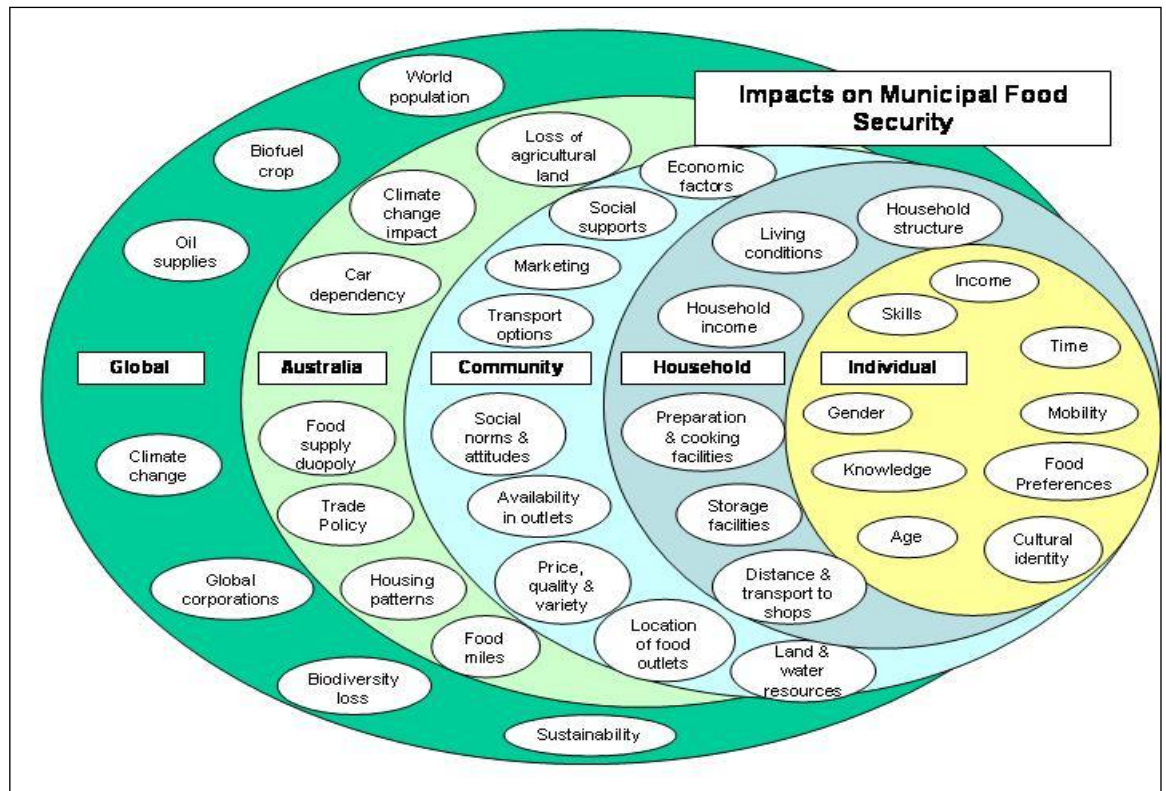
At the local government level, food security has attracted some political attention in recent years. Gold Coast City Council for example, identified local food production as an important element in its climate change adaptation strategy and commissioned a scoping study of local food production and purchase (GCCC, 2011). This included urban food security in a more holistic manner and recognised the environmental, economic and social benefits of developing a more integrated and extensive local food system.

In Melbourne, nine local governments were funded to recruit food security officers as part of a five-year project called *Food for All*. *Food for all* aimed to integrate planning within and between the nine participating Councils, and its first step was to integrate food security into local government policy. A positive outcome of the project was the incorporation of food security in the Municipal Public Health Plans (or Municipal Public Health and Well-being Plans) of many councils. The Project evaluation reported that these new plans improved upon previous versions by shifting from a focus on healthy eating and nutrition, into a broader debate about food access, food affordability and food security. Furthermore, the new plans have 'a stronger focus on addressing the factors that underlie food security, such as healthy urban planning, and access to employment, affordable housing and planning'.

Four of the participating councils in Melbourne have now adopted separate food security policies. One of these, Maribyrnong City Council, defined food security in the FAO and VicHealth terms of guaranteed physical and economic access but, significantly, also acknowledged the likely impacts of climate change and resource constraints on food security:

*The understanding of food security is also moving towards inclusion of sustainable production methods as a response to the emerging longer-term sustainability issues [Maribyrnong City Council, Food Security Policy, 2011-2013].*

This suggests the emergence at the local government level of a more holistic and integrated understanding of the multiple determinants of food security, as reflected in the diagram below, which appears in the Maribyrnong Food Security Policy. These determinants were also tested by the Council in extensive public and stakeholder consultation, which informed the development of the policy.



**Figure 2: Impacts on Municipal Food Security**

Adapted from 'Rychetnik, Webb, Story & Katz (2002) *Food Security Options Paper*, NSW Centre for Public Health Nutrition,' and 'Dahlgren G & Whitehead M (1991), *Policies and Strategies to Promote Social Equity in Health*, Institute for Future Studies, Stockholm.' Reproduced from the Maribyrnong City Council Food Security Policy, 2011–2013.

Furthermore, Melbourne City Council, which was not one of the nine local governments that took part on the Food for All project, recently released its own Food Policy, demonstrating that food security is becoming a more common theme at lower level governments. The City of Melbourne's Food Policy sets out 'five key themes' to guide its strategic directions and actions towards food security, including:

- strong, food-secure communities;
- health and well-being for all;
- a sustainable and resilient food system;
- a vibrant local economy;
- a city that celebrates food.

Here, food security, or access to nutritious and safe food is treated as a basic human right, which should be enhanced by collaborative action across local government. The health and well-being for all component refers not only to individual health and well-being through increased access to healthy and nutritious foods, but also to enhanced environmental well-being with a focus on 'sustainably-produced foods and food choices'.

The City of Melbourne's Food Policy presents a multi-dimensional conception of food through a food systems approach. This more holistic and integrated attitude was expressed also by a number of interviewees, including a practitioner from the non-government sector explains:



*Food security has been around for a while, through the work of VicHealth, and there's a language and narrative around that. But FSPUD [food sensitive urban design] is broader, it's about food resilience, of which food security is an element. It's about broadening their [local government planners] conception of food security, which had to do with running out of food, to one in which we think of preventative strategies to provide well for as many people as possible, and the systems are robust, in terms of facing the challenges we're confronting [Non-governmental organisation Employee].*

Broadening even further the conception of food security, the notion of *food resilience* was also raised by a number of interviewees who have expressed their understanding of food security in terms of greater levels of individual and community self-sufficiency. They have talked about 'people growing their own food'; and activities such as food sharing, seed swaps and plant exchanges. A backyard gardener and permaculturalist from Melbourne spoke on his behalf and his fellow gardeners:

*Our focus is about people producing their own food. We're about food security as growing food to keep people alive, not food security as producing food as a commodity for a consumerist society. [Food is] not a means of making money, it's a means of keeping people alive. Our focus isn't on yields and produce, at the cost of quality. Our focus is to produce yields and big harvests with the highest of quality. We're aiming at food that has high nutritional value, and long-term has benefits in terms of reducing government outlays on health. [Backyard gardener and permaculturalist, Melbourne].*

Similarly, on the Gold Coast, food security has been explored at the individual level, with an increased emphasis on food production and sharing initiatives:

*Food security is not having to go down to the shop and buy your own. It's about growing your own and so in terms of food security for people it cuts down on food miles and that's a good thing. But it's really not generating much in the way of people's food security, if they come here and buy stuff all the time. We've got people who come here and they've looked at us and again some of the unemployed people, like that guy I was just talking about who's now employed full-time. He lives in a boarding house and he's got this massive food garden in the back of a boarding house and so he's cooking with gas. Another guy, an artist who paints our beehives – we've got two artists – and he's all fired up and he's taken water weed and you name it home to build his own garden. I guess it's good in a way here that it provides security for people to have an alternative form – like an alternative production area for food so that if something goes wrong somewhere else, then okay, there's always there's food here. They could come here instead of going to the supermarket but yeah, I'd really like to see more people growing their own stuff [Market gardener and permaculturalist, Gold Coast].*

Another local gardener specifically emphasised the need to share surplus food as a means to curb food insecurity;

*The good thing here is like if somebody's got something new or got too many of one thing, they'll say 'Would you like to have a seedling of this?' [Community gardener, Gold Coast].*

One of the backyard gardeners and community food activists with whom we spoke highlighted the concepts of control and self-sufficiency in her understanding of food security:

*[Food security] means having control over my own food, knowing I'm going to have continued access to it. Self-sufficiency is not quite my aim. I want to provide for as much of my own needs as I can, but I don't think total self-sufficiency is a realistic objective. Our aim is not to have to buy any fruit and vegetables during the summer and autumn. [Backyard Gardener and Permaculturalist, Melbourne].*

A clear example of the perceived benefits of self-reliance and becoming individually more food secure is presented by an organic grower and activist from the Gold Coast. Her experiences with the Brisbane floods were both dramatic and enriching:

*Well, for instance when we had the floods and people couldn't get milk everyone went nuts because they couldn't get milk for what was it a day or two? And then the price of vegetables when through the roof. Well, yeah, those kinds of floods affected us too and you know some of the stuff in our garden fell over and died as well but there were things there that we wouldn't have starved, we might have got a little bit hungry and baked beans might have been on the menu for a few nights, but it would have been with some salad and parsley and grind up a green paw-paw for a nice Thai green paw-paw salad, you wouldn't have just survived, you could have lived. [Non-government organisation employee, Gold Coast]*

Adding another dimension to the debate, academic researchers were especially concerned about the issues of environmental sustainability, intergenerational equity, climate change, resource resilience, and fairness. One offered this multi-dimensional conceptualisation of food security:

*Food security is sufficient, equitably accessible and sustainable food. Sustainability in this context means food produced in such a way that doesn't undermine the ability of future generations to meet their own food needs. That's really important, and isn't talked about enough, especially in relation to water and land issues, on the peri-urban fringe.*

*Secondly, that we're meeting food needs into the future, taking into account the conditions we're likely to face into the future. That's to say, oil, land and water all becoming more scarce, and the price of oil becoming more expensive. And the climate change implications that I believe we're going to face, and that we're already starting to see...*

*The third key aspect is fairness – that we're producing food in such a way that it's viable for farmers to stay on the land, and continue producing that food. Fairness doesn't often come into the definition of food security, but if you want long-term food security and a resilient system, then you actually need to be paying people to stay on the land. There's so many farmers leaving the land at the moment, that's a real issue, and should be seen as a really core element of food security [Academic researcher].*

Our research was also interested in better understanding what factors, if any, were likely to be driving food insecurity in Australia. Similar to the varying views on how food security is characterized, the perceived drivers of food insecurity were many and from different stances - environmental, social, economic and built form. We attempted to capture different perspectives on Australian food insecurity as food insecurity in Australia has traditionally been understood and researched only in economic terms, i.e. by reference to the 'single question' asked in population health surveys - 'Have you in the past 12 months run out of money and been unable to purchase food?'. This 'single question' method, however, provides only a partial understanding of food insecurity, both in terms of the nature of the phenomenon and its extent. Thus, consistent with the broader conceptualisation of food security presented earlier, interviewees were encouraged articulate their views on food insecurity from perspectives beyond simply the economic.

Factors associated with climate change such as increased temperatures and drought, or floods and fire events, were constantly mentioned, although climate change per se was not often raised as an encompassing phenomenon. This was mainly in the context of supply chains disruptions and/or their impacts on food prices and food availability. This concern was fuelled by the impacts of the 2011 South-East Queensland floods that temporarily, but severely, disrupted the food supply chain to Brisbane and surroundings, and tropical cyclones in North Queensland that devastated banana plantations driving up prices for almost one year after the event.

Other environmental factors pointed out by participants were the emerging constraints posed by diminishing resources that formed the basis of essential agricultural inputs – especially oil and fossil-fuel derived inputs as well as phosphorous-based products. Soil loss through erosion, soil contamination by industry and agro-chemicals and the lack of water resources were also described.

Social factors refer to human capacities and resources that either enhance food security or constitute drivers of food insecurity. In terms of existing levels of food insecurity, interviewees mentioned the following factors:

- lack of skills, knowledge and experience – individuals not knowing how to grow, store, prepare and cook good quality food;
- language barriers, for newly arrived refugees and immigrants, including international students;
- social isolation – individuals not having the opportunity to acquire necessary skills and knowledge to grow and cook food, and eat well;
- lack of time – individuals not having the time to acquire the necessary skills and experience; and,
- food waste – where surplus or unused food is thrown away rather than being used to feed people in need.

Lack of skills and knowledge surrounding food is widespread, and many adults and children, have little understanding or appreciation of what constitutes a healthy diet. Some interviewees talked about a lack of basic 'food literacy', which included both basic nutritional and biological knowledge and wider questions of the political-economy of the food system. One commented:

*There's a real need for food literacy – we need a population that can be so much better educated about where food comes from, how it's grown, food chains and*

*so on. You read appalling things about children not knowing where milk comes from, for example. Just basic facts like the monopoly of supermarkets – what do people know about that? How it affects the farmers – who's screwing who, and why? Why are people afraid to grow their own? [Academic Researcher, Melbourne].*

This food ignorance may be reinforced by various economic factors, including the income levels of individuals and households, and macro-level questions regarding the broader political economy of food. In terms of other economic drivers of food insecurity, interviewees mentioned the following factors:

- poverty, understood as vulnerable groups (homeless, students, newly-arrived refugees, single-parent households and children, tenants in public housing, people dependent on Centrelink payments) having inadequate incomes to afford healthy food, and sometimes to afford food at all;
- the 'corporate-controlled food system', and its impacts in terms of pressures on farmer viability, and its influence on dietary preferences; and
- global instability, for example food riots and bans on exports that occurred during the global food crisis of 2008.

A significant part of the problem with respect to income poverty is that healthy, nutritious food is often beyond the reach of members of the population in lower income brackets, while less healthy options can be more affordable. This was confirmed by a June 2012 survey released by the Australian National University, which found that 13% of a randomised sample of 1,200 respondents said that they could not afford to purchase foods that would make up a nutritionally-balanced diet. Further, 8% of respondents said they often or sometimes struggled to purchase any food, and 16% respondents said that they often or sometimes worried that they would run out of money to purchase food. These findings confirm the views of participants in this research, which suggest that certain types of foods – the more unhealthy ones – are too cheap, relative to healthier foods. As one interviewee commented:

*Maccas is too cheap. We need to subsidise organic produce, perhaps by getting more volunteers working in its production [Non-Government Organisation Volunteer, Melbourne].*

Similarly, another interviewee shared a story about the affordability of fruits and vegetables in some locations of the country compared to industrialised fast foods:

*[Last] week on the radio, [there was a story] about some indigenous doctor [that] had been travelling around in the far north [of Queensland] looking at remote communities where they say that the cost of fresh fruit and veg was just astronomical. Seven bucks for a cauliflower, a dollar for a tomato, whereas you can buy a bucket of fried chicken for a dollar fifty [Community gardeners, Gold Coast].*

Interestingly, at the same time that prices are too high and not affordable for some, farmers are also complaining about not covering their own costs. A community gardener, who grew up in a farming family, tells that:

*Yes, I grew up in a farming community and similar problems [occurred to] ourselves, we grew snow peas but we couldn't make enough to cover the cost of taking them to market so we didn't grow them anymore. On one hand for food*

*security I recognise that the cost is very problematic, like a lot of people have issues with being able to afford fresh fruit and vegetables, they've done some research interviewing older women and a lot of them are saying 'well I can't afford healthy food, I'd like to buy more fresh fruit and vegies but it's just too expensive'. But on the other hand, I know talking to the farmers at the farmers markets they are having difficulties meeting their costs, so there seems to be a mismatch there and I'm not sure, you know, what's going to happen with that [Community gardener, Gold Coast].*

A recurring theme in discussion of the drivers of food insecurity was the increased market share of genetically modified foods and the consequent loss of traditional plants and traditional ways of cultivating food species:

*I think it is terrible what happens with foods and seeds and so on. On Monsanto seeds in America is a classic where they put the genetically modified potatoes to prevent grubs from getting in and so on...I'm all against this genetically modified foods because, to me, you don't know what effect it's going to have later on in life and so on... So, the heirloom ones are [important for food security, because] a lot of the stuff that you get these days are hybrid. In other words, they've been bred around and they introduce a lot of other things with it, so, it's not the pure vegetable and not the pure seeds. So, by going back to the heirloom, you've got stuff that was grown two or three hundred years ago ... [Community gardener, Gold Coast]*

Finally, the built form dimension deals with questions of planning and infrastructure. Interviewees identified inadequate distribution mechanisms which could lead to the existence and expansion of food deserts. Food deserts are understood as areas where a significant proportion of households are not within walking distances of fresh food outlets. The phenomenon of 'food desertification' applies both to inner city areas as well as to outer suburban areas of Melbourne and the Gold Coast, where the principal fresh food outlets are the large supermarkets located mainly within shopping centres, which are mainly only accessible by car.

Another feature of food deserted areas is the concentration of fast food restaurants offering cheap family meals, which become an attractive option for time-poor families living in outer suburban areas that often also face long daily commutes to work in the city. This in turn raises the wider question of urban sprawl, where new growth areas on the peri-urban fringes are zoned without a long-term strategy for regional economic development and job creation. A senior manager in one of the 'interface' Melbourne councils commented:

*[A]ll these issues are connected, and many come back to the jobs issue. You have 70% of the working population leaving, going off to work every day somewhere else. It takes time to travel, you have two kids in the family, with 90 minutes commute each way. The kids are in child care, the couple have a big mortgage, they have two cars to run. They get home and they're tired. The last thing they want to do is cook a nutritional meal for their kids, when it's so easy to go to Maccas or KFC or get a pizza. That's the problem we face. Until we start tackling all of these issues, the suburbs are going to be the dumping ground for obese, diabetic unhealthy people [Local government employee, Melbourne].*

#### 4 Urban Agriculture: perceptions and understanding

Despite the continued existence and indeed expansion of a wide range of food production activities in cities, as Pires (2011) notes, the very notion of urban agriculture is seen by some as a contradiction in terms – agriculture being something that happens beyond cities in rural areas. Most definitions of urban agriculture include a variety of activities carried out at many different scales, from the domestic to the city-wide. Although definitions vary to some extent by region and country, they are increasingly embracing this wider range of activities.

The general conceptions of urban agriculture offered by our interviewees were similarly broad and inclusive. They included the following:

- anything that's produced in the city, and used by and for the city [Independent Researcher, Melbourne];
- putting productive plants in the community [Backyard gardener, Melbourne];
- agriculture and gardens producing within urban barriers, including peri-urban zones. It's not necessarily commercial, it would include backyard production. [Academic researcher, Melbourne].

Nevertheless, opinions of what urban agriculture is and what it entails were varied. One academic researcher pointed out that urban agriculture means different things in different cultural and geographical contexts, with a particular distinction between the global north and the south:

*It means different things in developing countries. In Australia, it's backyard and community gardens, and perhaps peri-urban market gardens. Here [in the inner city of Melbourne] it's generally not commercial-scale, as in US spin farming, which can be done on little blocks of land. In countries like Ghana there are stronger economic drivers and lighter regulation – for example, they use raw sewage to grow food, which obviously creates a transfer of pathogens. Conversely there are benefits with the higher nutrient content of the water [Academic researcher, Melbourne].*

Others looked to initiatives and approaches overseas as an explanation of what urban agriculture is, and what it could be in Australia:

*The model we like is Havana [Cuba], and we ask ourselves how it could be replicated here. They achieved a 1000% increase in productivity per unit over an 11-year period with key factors including intensive research into bio-fungicides, bio-insecticides and integrated pest management, together with the wide diffusion and accessibility of that knowledge. The pro-huerta movement in Argentina has also achieved impressive results in urban food production [Academic researcher, Melbourne].*

An Urban Agriculture Officer from a local government area in Melbourne brought a valuable cross-cultural understanding and experience to these issues. Having worked as a small scale commercial market gardener in the Bay Area of San Francisco and being familiar with the burgeoning local food and urban agriculture movement in the

United States, he offered the following view on what urban agriculture is, highlighting the historical continuities between what is happening now in terms of food production in cities, and earlier practices:

*[Urban agriculture] is opening up the spaces 'in-between'...there's quite a bit of land that can be accessed in the urban setting, and could be developed into something productive. It will take some alternative methods of cultivation, some very resilient farmers that are able to adapt and move between those strips of land. But in my mind that's what it's all about – opening up what has previously been considered to be collateral damage of urban development. That's roof-top spaces, that's nature strips, that's edges of parklands – places that can be productively farmed, and have immediate access to the market, while providing job training and employment opportunities for people in the inner city. And I think really restoring that – every city has a history of urban agriculture where glasshouses or greenhouses existed, or bio-intensive production happened, animals were kept. It's not something new, though we treat as though it is... It's just that we've forgotten the power of those in-between spaces to produce quite a bit of food [Local government employee, Melbourne].*

This concept of the 'spaces in between' is useful in terms of thinking about the potential for urban agriculture to expand in Australian cities and urban centres. The work of Permaculture Gold Coast on a small private site in Southport is one example of what can be achieved by creative individuals and community groups working in partnership with their local councils.

Interestingly, another academic researcher, who had conducted a number of forums with farmers and market gardeners on Melbourne's peri-urban zones, commented on their somewhat disparaging perceptions of activities typically regarded in Australia as urban agriculture, such as community gardening:

*[Some] farmers think it's naïve, one comment after a forum was, 'They think we can all grow tomatoes in pots on the balcony, and that there'll be enough food'. So there's a perception [amongst farmers] that urban agriculture is just small-scale food growing in the city, that's it not commercial, that's it not going to make any contribution to food supply. I think we should be seeing [urban agriculture] more broadly, that we should include what's on the fringe as well...agriculture that takes place on the urban boundary. That would include areas of quite significant food production; and the same would apply to the fringe areas of satellite cities. [for Melbourne] I'd include Casey-Cardinia, and Werribee, Bacchus Marsh, Yarra Valley. If we're talking about agriculture, it's more than pottering around in community gardens. So we have to include peri-urban agriculture – where agriculture meets the city, and all those issues on the fringe of the city, those tensions [Academic Researcher, Melbourne].*

It was suggested that the terminology of 'urban agriculture' might not be appropriate to describe non-commercial activities such as backyard and community gardening; and whether instead the term 'urban gardening' might be a better description of such activities. While there are few signs of this distinction entering the policy literature, it does not of course prevent councils and policy-makers being cognisant of the different functions and roles of non-commercial community gardening, and commercial-scale urban food production in a city or peri-urban market garden.

Adding to the debate surrounding urban agriculture practices, including its yield and commercialisation potential, is a reoccurring question about profitability or even the possibility of producing enough food in the confined spaces available within the urban environment. However, as demonstrated by the small scale farmers on Tamborine Mountain, small spaces can be very profitable and can be cultivated in such a manner that they produce more than a family could consume.

*The problem is they don't know anything, and people think they that need to buy 10 acres or 20 acres and they don't, if they get half an acre, which is an ordinary block here, it is big enough to grow far more than you need yourself - you can make a living off a garden plot. The big thing that people don't realise is that urban agriculture, agriculture of any sort; you can grow an enormous amount in a very small area of land [Organic farmers, Gold Coast].*

We noted in the literature review that there is a tendency to conflate urban agriculture with community gardening. Almost all interviewees mentioned community gardening when asked to state what sort of activities and practices they would include under the umbrella of urban agriculture, however almost without exception they went on to list a much wider range of activities:

Aquaponics/hydroponics	Guerrilla gardening
Backyard gardens	Market gardens/peri-urban production
City farms	Restaurant gardens
Chicken-keeping & micro livestock	School gardens
Community gardens	Seed sharing
Community composting	Street gardening & verge/nature strip planting
Community nurseries & plant exchange	Vertical gardens
Farmers' markets	Urban beehives
Food forests	Urban mushroom farms
Food swaps/exchanges	Urban orchards
Green roofs	

As this list illustrates, the interviewees typically had a very inclusive and expansive conception of what urban agriculture is, and what it could become. One expressed a vision of a city overflowing with food in many sites, a sense of sustainable abundance:

*I see it very broadly – community gardens, school gardens, restaurant gardens, market gardens, home gardens, office gardens, rooftop gardens, vertically-integrated agriculture, gardens in aged-care homes, gardens for people with mental health issues, social enterprises incorporating food production – you can go on and on, the sky's the limit. There would be food everywhere – the true 'eco-city'. [Non-government organisation, Melbourne.]*



This vision highlights the multi-functionality of urban agriculture, and in particular its capacity to build community, in addition to any contribution it may make to net food production and thus to urban food security.

An interesting and relatively novel concept in Australia that was raised nevertheless by some interviewees is that of community farms, where members of the community are able to learn and practice organic methods of cultivation while fostering community spirit and being rewarded financially and/or through fresh fruits and vegetables. In a recent and innovative project on Tamborine Mountain, Gold Coast, small farmers have initiated a community farm which operates in conjunction with an organic cultivation training course.

*The idea of making it a community farm rather than a garden, where people could participate in a commercial farm and see what other crops are grown and so on... We started this idea to combine the practical training with the community farm formally only last year, and we've now got 20 people all doing our training who do the practical work here on our property. We give them [community farm workers] a little plot so they've got their own plot but they also then see what other people are growing on the plots nearby, we also get them to participate in our actual farm, where we grow over 50 crops. So our farm has developed into one where we grow 50 fruits and vegetables, herbs and nuts and berries - so they get the cost of the training back through fruits and vegetables harvested from the farm. Then the other concept we had last year was when they finished the training, which is a prerequisite, they could then become part of the community farm on an ongoing basis. We share the profits in proportion to the time they spend on a monthly basis and we produce a monthly set of accounts and a monthly bulletin telling them what's going on and what we've done and what our plans are. We produce a summary now of the products we've sold each month so you can see the seasonality and which ones are making money and so it's made the farm a bit more businesslike and it's also gradually making it more profitable with less work from us.*

#### **4.1 Urban Agriculture in practice in Melbourne and the Gold Coast**

Consistent with the expansive visions and inclusive conceptualisations of urban agriculture outlined above, interviewees identified a similarly long list of urban agriculture examples taking place in and around Melbourne, as well as on the Gold Coast and surroundings. As shown in Table 1, urban agriculture in the case study areas is not solely about food production, and there are numerous other examples of practices in education, policy, food processing and retailing.

**Table 3: Urban agricultural practices within the case study areas**

<b>Production</b>	<b>Aquaponics</b> <b>Backyard gardens</b> <b>Community farm</b> <b>Community gardens</b> <b>Green roof</b> <b>Guerrilla gardening</b>	<b>Hydroponics</b> <b>Market Gardens</b> <b>Micro-farms</b> <b>Nature strips</b> <b>Permablitzes</b> <b>Permaculture</b>	<b>School gardens</b> <b>Street planter boxes</b> <b>Urban beehives</b> <b>Urban food forest</b> <b>Urban orchards</b>
<b>Training</b>	Food skill	Work for the Dole	
<b>Processing</b>	Coffee production Green shed	Individual preserving	Olive oil processing Wineries
<b>Distribution</b>	Wholesale market Community nursery	Monthly food swaps Seed & plant exchanges	Urban food maps
<b>Retail</b>	Fair food co-op Farmhouse direct	Food Connect Green shed	Local restaurants Permaculture store
<b>Preparation</b>	Community kitchens		
<b>Eating</b>	Healthy Eating: work of health promotion teams		
<b>Waste</b>	Backyard composting Community garden composting	Composting & worm farming workshop Composting micro-enterprises	Food bank Food rescue Second bite
<b>Education/ Research</b>	Arable land scoping study Benefits of local food supply Collingwood children's farm Composting workshops Cultivation workshops	Food alliance Food garden mapping Food hub scoping study Food sensitive planning & urban design Food supply scenarios	Food gardens network Permaculture systems training Port Phillip urban fresh food network School gardens
<b>Policy</b>	Bunyip food belt project City of Melbourne obesity policy Food alliance	Food for all project Food security project Gold Coast scoping study for local food production & purchase	Healthy communities initiative Urban agriculture guidelines

From the numerous examples of urban agricultural practices taking place in both Melbourne and Gold Coast, there are some that are worth highlighting.

*The highly productive market gardens and farms concentrated in Werribee to the west, and Casey-Cardinia-Cranbourne to the south-east of Melbourne provide a good example of what can be achieved in both urban and peri-urban areas. Between them, these areas produce over half of Victoria's annual commercial vegetable production, and 17% of the state's fruit production (Food Alliance Resilient Food Supply report).*

#### *CERES Aquaponics Food Hubs Project*

An adaptation of hydroponic farming is aquaponics, which is the integration of fish rearing into a hydroponics system, through a combination of aquaculture and hydroponics. Interviewees reported that small-scale aquaponic systems are being established in a number of back gardens in Melbourne's inner suburbs. An innovative aquaponics project is also being piloted by CERES, the community environmental education centre located on a 5-acre property adjacent to Merri Creek, in Brunswick, inner north Melbourne. A project officer described CERES as:

*An environmental education centre. It's a 30-year old experiment of a community group of a dozen people getting together and discussing how, in an area of then high unemployment, people could come together and create jobs, or useful things for people to do, and turn an area of vacant, polluted land, into a community park. It's part-business, part-community, and provides spaces for all kinds of wonderful things to happen [NGO employee, Melbourne].*

Running at optimal efficiency, their aquaponic system 'can produce 750 units of vegetables per week', and has several other design features which give it advantages over soil-based growing:

*You don't have to weed; harvesting is just pulling out the plants and chopping the roots off; it's easy to access because it's all raised. There's no digging. At the centre there will be intensive production – aquaponics or hydroponics – but there will also be raised [soil] beds, because we want a diversity of production systems. However in our modelling those raised beds will be revenue neutral, because it's bloody hard to make money out of conventional farming. So we model aquaponics, because that's what we understand [NGO employee, Melbourne]*

The CERES aquaponics scheme aims to provide a replicable project, which makes small scale urban farming financially viable, thus making it an attractive business opportunity for urban residents. The pilot project operates on approximately 300m<sup>2</sup> of land, which is considered a small-scale commercial operation which a single person can operate.

*The water is pumped through once an hour, the water goes round and round, you just lose a bit to transpiration. It's based on the nitrogen cycle, with the fish being your little fertiliser factory, and you also get to harvest them...The [plant] growth rate is huge, they grow at 3–4mm a day, we're looking at a 6-week cycle, 3 weeks in propagation, and 3 weeks in the grow beds, with the biological material. The greenhouse captures all its own water and all our plants are propagated inside.*

*The fish are stocked at a rate of 20kgs per 1000 litres. This compares to 100kgs per 1000 litres in a commercial aquaculture set-up. Here, the fish are just the cream on the top, they're 5% of total yield. We're planting at 50 plants per m<sup>2</sup>. The plants clean the water for the fish. [Steve Mushin, CERES Aquaponics project]*

### *Gold Coast Permaculture*

Gold Coast Permaculture started a few years ago with the intention of getting the community involved in a micro-business opportunity. Still in its early stages, Gold Coast Permaculture has nevertheless achieved a lot, not only cultivating a variety of vegetables using organic principles, but also operating a few bee hives and keeping 26 chickens. In addition, they are forging a partnership with Gold Coast City Council, to divert part of its aquatic weeds waste into their composting facilities:

*We take their aquatic weed and we take their woodchip because normally they'd dump that in a tip. They tip all their aquatic weed and it's about 1200 tonnes a*

*year of aquatic weed they tip into landfill and so we've taken about 500 cubic metres of that stuff so far; which is a significant amount and we compost it, as well as using it in our garden beds. So it's diversion of waste streams to show people that what you can do here is that you can garden using stuff that's just hanging around and going into the tip [Micro Farmer, Gold Coast].*

The micro-business side of the venture involves the sale of vegetables grown on site, as well as compost and honey. They describe their approach as follows:

*We just try to grow what's in season. We stick to basically salad greens and stuff that you can pile into the garden and make really productive and that's our major stuff that we sell to the public, kale, lettuce, silverbeet, Chinese cabbage, rocket, mizuna; things like that. We've got beetroot now as well. We don't grow many carrots. Carrots are too slow. Tomatoes we don't grow. The tomatoes are too slow. Beans are too much trouble, so we grow beans for ourselves. We grow eggplants, eggplants is good for the public because we've got some really productive egg plants. But yeah, stuff that's quick and easy and yeah profitable [Micro farmer, Gold Coast].*

One of the most significant achievements of Gold Coast Permaculture is that all their production happens on a site which they do not own. They approached a developer whose land was unused by occupied by squatters, and negotiated a deal in which they pay rent and use the land for as long as it was not needed by the developer. When the developer is ready to build on it, Gold Coast Permaculture will relocate at four months' notice allowing them to harvest the current crop and relocate their garden beds.

In addition to this micro-enterprise, Gold Coast Permaculture offers a number of garden beds for the community to use as their own community garden, and on weekends they offer courses, workshops and community activities.

The arc of suburbs within the local government areas of the cities of Yarra and Darebin were described as 'hot-beds' of urban agriculture activity and local food production. The cities of Maribyrnong and Port Phillip also have considerable levels of activity, with the former focusing on food security and the latter on community food growing.

Non-commercial urban agriculture is often understood solely in terms of community gardens, but as the literature review and the case studies have revealed, it is far broader than that. A notable practice to emerge in Melbourne and, to a lesser extent, the Gold Coast in the past few years is the permablitzing movement; permablitz being a combination of 'permaculture' and 'backyard blitz'. This is usually an informal gathering over the course of a day in which a group of people come together to: create or add to edible gardens where someone lives; share skills related to permaculture and sustainable living; build community networks; and have fun.

Over 100 permablitzes have now been held in Melbourne, and the movement has spread interstate and overseas. On the Gold Coast, the permablitz movement is starting to gain momentum, but it still lacks the numbers that Melbourne enjoys, with less than 10 permablitzes taking place to date.

### *Melbourne Food Forest*

A Melbourne gardener, known locally for his methodical and systematic approach, has built a backyard food forest, and has documented his progress: including species selection, plantings, climatic events and yields.

This gardener was motivated to create a food forest because of the increased 'scepticism towards permaculture' from horticulturalists in general:

*There was just too much doubt, too much dissenting opinion, about whether it can really work. So I said, enough is enough, it's time to call their bluff, and build something that shows it really does work. [Backyard gardener and permaculturalist, Melbourne].*

As a working scientist (toxicologist), he set out to use his backyard as an experiment, to document in detail everything he did, and all his yields, in order to demonstrate that bio-intensive gardening of this sort could be highly productive:

*I have no time or space for wild speculation. For me, my food forest was really to prove that the concept worked. As a scientist, if something's scientific, that means it's repeatable [Backyard gardener and permaculturalist, Melbourne].*

He built his food forest on the 'leached and lifeless' soil of his 80m<sup>2</sup> back garden during the winter of 2008. He calls his method 'backyard orchard culture'. Based around the careful selection and strategic siting of a range of different tree species (31), it is interspersed with numerous varieties of berries (21), herbs (90) and other perennials, with some space left for annual vegetables. Consistent with the permaculture food forest technique, he chose early, mid- and late fruiting varieties, because 'this gives extended seasonal cropping – instead of having one tree produce a glut of fruit all over a few weeks, you can extend your cropping [over several months].'

In terms of yields, he has documented approximately 200kgs per year, split 60 – 5 – 35% between the trees, berries and vegetables. However, all his trees are a few years away from maturity with a third not yet producing. He speculates that 500kg a year is feasible once all the trees have reached maturity. Nevertheless, his current yield equates to 14 tonnes per acre.

### *The South Melbourne Commons*

This is the result of a unique collaboration between the Catholic Archdiocese of South Melbourne, and Friends of the Earth. Located in South Melbourne, in the premises of a retro-fitted 19<sup>th</sup> century Catholic girls' school, the South Melbourne Commons is a multi-functional site combining 900m<sup>2</sup> of communal vegetable beds, a wholefoods café, a food co-op, a hall for events and community hire, and a social enterprise (pre-school play group). One of the volunteers commented that this project involved 'a number of inter-related and inter-connected things happening at one site, all of which would contribute to a self-sustaining venture'.

### *CERES Fair Food Project*

An off-shoot of the CERES Environmental Education Park in Brunswick, the CERES Fair Food Project was described as an outstanding example of community-led urban agriculture in Melbourne operating over the last thirty years. CERES Fair Food is a

social enterprise modelling a new form of more direct exchanges between farmers and consumers in Melbourne. CERES FairFood (and related initiatives such as Food Connect in Brisbane and Sydney) sources fresh produce and processed items on fair terms from 32 farmers and suppliers, most located within a 150km radius of Melbourne. The project then markets the produce to urban consumers in Melbourne, and employs a team of packers and drivers to make up vegetable and fruit boxes and deliver them to its customers. The enterprise has been in operation for just over two years, and currently delivers around 600 boxes of fresh produce per week, supplemented with various processed 'extras' such as bread, grains, cheeses, soy products, honey, tea, and coffee.

#### *The Green Shed*

The Green Shed emerged from the commercialization needs of local food producers on Tamborine Mountain, in the Gold Coast City hinterland. The Green Shed provides an opportunity for small and medium sized farms to sell their produce on a weekly and co-operative basis. Farmers harvest and deliver produce to the Green Shed, and at the end of the day they collect their money and any remaining goods.

#### *Bunyip Food Belt*

The Bunyip Food Belt was conceived during the years of drought as a large-scale infrastructure project, designed to extend the existing irrigation piping that delivered recycled water from the Eastern Water Treatment Plant into Cardinia, Cranbourne and Koo-wee-Rup. The project is a consortium of three councils – the cities of Casey, Cardinia and Mornington Peninsula, together with three water companies – South-east Water, Melbourne Rural Water, and Southern Water. It was intended to 'drought-proof' the highly-productive market garden areas on the south-east fringes of the city. A feasibility study carried out for the consortium in 2010 revealed that the additional land brought into irrigated production as a result of the new water infrastructure would generate over \$200 million of added value to the regional economy, and an additional 2,400 jobs by 2030. Subsequently, a Bunyip Food Belt brand has been created and on the basis of that brand and the assumption of increased agricultural production, Casey-Cardinia Council is seeking to attract investment to the region, with a focus on food processing and manufacturing

#### *Casey Food Hub*

Food Hubs, conceived as 'centrally located facilities with business management structure, facilitating the aggregation, storage, processing, distribution, and marketing of locally/regionally produced food products' (USDA 2011), emerged in the United States over the past decade as the 'missing piece' of infrastructure in emerging local food economies. Figure 2 below shows the multi-functionality of Food Hubs, in terms of their diverse economic, social and educational activities. While their operations and governance structures vary considerably, nearly all Food Hubs appear to share two key core objectives: improving the livelihoods of local farmers and growers; and increasing access to healthy fresh food for all residents.

In 2011, the City of Casey and VicHealth commissioned a team of consultants to scope the potential for a Food Hub to be established in the Casey-Cardinia area. Based on

stakeholder consultations, the report suggested that a local Food Hub should have three core objectives:

- better marketing outlet and fair prices for producers;
- healthy eating for residents – more fruit and vegetables;
- skill development, community connection and job creation through new local enterprises.

#### *Policy initiatives*

The VicHealth *Food for All* project had the objective of raising the prominence and priority of food and food security in council policy documents and significant policy change is now taking place within a number of Melbourne councils.

One outcome from the *Food for All* project is that a number of local governments have taken policy initiatives to support the development of urban agriculture, and integrate food security issues into their planning frameworks. The city of Yarra passed its Urban Agriculture guidelines in June 2011.

*These are tools which say there's a process that you follow, here's an officer in Council that you can contact, to help you navigate the process... Places like Maribyrnong, they have a 'Growing Food, Growing Maribyrnong' project coordinator who is redeveloping all their community gardens. They're trying to reclaim all that contaminated land, those brownfields, and develop it into community gardens, targeting the desertification issue...the City of Melbourne has put out urban agriculture guidelines for street gardens...they'll probably create a position to look after it. That's a big cultural watershed, when the City of Melbourne is doing that [Local government employee, Melbourne].*

The next step is to link these various initiatives together in order to facilitate sharing of best practice and mutual learning. While this is already beginning to happen with some local councils, there is a significant opportunity for a Melbourne-wide initiative to form at local government level.

## **5 The impact of climate change on food security and urban agriculture**

The effects of climate change are likely to exacerbate a range of existing problems with food supply, including the problems of food security and food colonisation. Morgan & Sonnino (2010) use the phrase 'the new food equation' to describe the constellation of complex new developments that have obliged politicians and planners to treat food policy more seriously. This constellation includes the food price surge of 2007/08 which led to a sharp rise in global food insecurity. This contributed to the current position of food security as a matter of national security in the UK and may be leading to new forms of 'food colonialism' (Morgan & Sonnino, 2009:210) whereby cash rich but food poor countries systematically buy up the productive capacity of poorer countries. Rapid urbanisation in many countries is also raising concerns about the resilience of urban food supply chains. While the effects of more variable rainfall patterns, more very hot days, more severe storms and changing patterns of vector borne diseases are likely to have profound effects on traditional agricultural practices, they will also affect urban agriculture.

Among the commercial farmers, backyard gardeners and growers we spoke with, there was a degree of generalised scepticism about the empirical reality of anthropogenic climate change, but some have portrayed clear climatic changes or events that have significantly affected their food production capabilities. Scepticism appears to be reflected also in the current Victorian and Queensland administrations, with interviewees reporting a strong strain of climate scepticism and even denial amongst leading politicians. By contrast, urban agricultural practitioners and researchers with whom we spoke firmly believed that climate change would affect food production.

The research revealed that there is, as expected, a mixed reaction towards the existence and the impacts of climate on food security (or food production) in Australia. Ranging from politicians, to commercial farmers to hobby gardeners, climate change scepticism and even denialism was evident. One of the most concerning revelations was the perceived lack of concern about climate change among some politicians:

*In their [politicians] worldview, climate variability, resource constraints, land use conflicts, none of that figures into their calculations. In general, they are climate change deniers. Climate change is an economic problem...[and] now we're basically not talking about it at all, it's fallen to the wayside...to the point that they have even cut the climate change unit in DPC...[but] this wave of denialism, and anti-science, is not unique in Victoria, it's across Australia [state government employee].*

The recently elected Mayor of the Gold Coast, whilst not rejecting scientific evidence about climate change, has been reported recently as saying that it is simply too far away in time for him to be concerned about sea level rise:

*I don't intend to use our ratepayers' funds for something that is going to happen in 90 years. It may or may not be wiped out...I live on the water and what may happen to my house in 90 years is not my concern (Gold Coast Bulletin, 27/9/12).*

Many commercial and hobby farmers expressed their disregard for climate change, often suggesting that this was a natural event. For example, an older dairy farmer from the Mornington Peninsula, who began farming in 1973, expressed his disdain towards climate change:

The climate's been changing for millennia. I don't think there's anything that's happening now that's out of the ordinary. We've had droughts before. We've had rain before. We've had wet years before, and similar patterns to the last 10-15 years... In geological terms, we're pissing in the wind. Nobody wants to hear that. It's good going and planting trees and all that, but the environment, where I grew up, is so different now to when I was a kid [Dairy farmer, Melbourne].

A major commercial horticulturalist from the same region, whose family had been growing for a number of generations, shared his scepticism and disdain towards the very proposition that anthropogenic climate change existed as a phenomenon, albeit in a somewhat contradictory manner:

*Climate change is all bullshit, people just jumping on the bandwagon. Nature has to take its course, we can't stop it, we can't control nature. There was ten years of drought in Clyde, but now the weather's changed again. There are sometimes early springs, and early summers. If that happens, we adapt, we do the best we*



*can. We sense the changes. The early springs and summers mean that it will be hot and muggy and wet [market gardener, Melbourne].*

Furthermore, a small-scale market gardener from the Cardinia region in Victoria, explains that even though the science of climate change have advanced and 'proven' the phenomenon, he has not seen any difference to his farming:

*Nothing has really changed for us in the 30 odd years that we have been gardening, including the climate, it changes with the seasons. So perhaps the climate (which we live and work in 24/7) is what we adapt to on a daily and weekly basis. We don't think oh... in 10 odd years it will be warmer or cooler so we better plant this now! This is a controversial question assuming that climate change is proven factor, and difficult to answer. We adapt and deal with it daily [Market gardener, Melbourne].*

In comparison, subsistence and hobby growers have expressed their concern towards climate change, pointing out that there seem to be a lack of understanding and even some narrow mindedness about the topic.

*Well you know I come to this from a strong sustainability perspective but not everyone does. I'd probably say few people probably do, who are getting involved in community gardens and so, you know, people linking a community garden with climate change as a mitigation strategy is probably few but I think it takes people like myself [and others] talking about it within the group and we'll do workshops and that sort of thing and that'll hopefully broaden people's perspective of their ability to affect climate change. [Community gardener and permaculturalist, Gold Coast].*

Lack of data, information and local modelling were also suggested as a deterrent to understanding and adapting to climate change:

*I am really concerned about it [climate change]. I mean deeply concerned. And yeah I think we have got to stop just sticking our head in the sand and start really having a good look around and preparing and looking at data and research so we can factor that into our preparations and here I don't know I would really like to be able to get hold of some sort of forecasting information about what they think the [Gold] Coast is going look like. Will it get wetter? Will it get dryer? Obviously there are weather fluctuations [from] climate change or not, so this idea that things that are dry, [are] they are going to be dryer? If they are wet are they going to be wetter? If cyclones are going to be bigger, more of them and sooner, longer, that kind of thing you kind of want to factor that in [Non-government organisation, Gold Coast].*

Despite this apparent scepticism or lack of knowledge about climate change and its impacts on food security, numerous concerns were raised. Concerns about increased drought, higher temperatures, water shortages, extreme events such as hail storms, sudden temperature fluctuations, shorter summers, and milder winters were raised by many interviewees.

An experienced backyard gardener and life-long Melbourne resident, commented that the 'real warm springs and damp summers' are a 'drastic change' which had impacted

both backyard gardeners like himself and commercial producers in and around Melbourne:

*The weather changes are a real concern, we've seen a progressive decline in the weather, and I've had to change my strategies about how I grow [my plants], how I prune [my trees] so they get more air circulation, putting them in warmer spots so they dry more quickly... Now what we're getting is much shorter summers and sudden fluctuations in spring [Backyard gardener and permaculturalist, Melbourne].*

This gardener also commented on the milder winters, which seem to many to be another trend for Melbourne:

*It didn't get cold enough for a lot of plants to die down, so that asparagus, which should die down in winter, and produce new spears in the spring, it didn't do that, it was far too mild. We had some fruit trees flower for a second time, which they don't normally do, because it stayed warm into late autumn... [The mild winters are] a real worry, [especially for commercial growers]. A lot of fruit requires a certain chill temperature, so they can produce in the spring. Because our winters are getting milder, we might not get enough chill period for the apples to produce properly. [Backyard gardener and permaculturalist, Melbourne].*

The disturbed water cycle was also a talking point on the Gold Coast, especially after the 2010/2011 floods. A well-established organic farming couple, with over 15 years' experience farming on Mount Tamborine, in the Gold Coast hinterland, explained how the changes in rainfall patterns and volumes has affected them in the past few years:

*Talking about weather, you were talking about climate change and that, we've had two of the worst years in 16 years you know, last year it was the floods where whilst it didn't flood on the mountain it was three months of persistent rain and no sun and we got to a stage where by March, for the first time, we didn't have anything to pick, you know it was so waterlogged, and because there hadn't been any sun, nothing was growing – if you put a seed in, it wouldn't grow [Farmers, Gold Coast].*

Another interviewee in Melbourne commented that water restrictions made backyard and community gardening difficult, especially for those who did not have rainwater capture and storage tanks:

*In the drought, when we were on 3 and 3A water restrictions, there was no accommodating people who wanted to grow their own food... You had to apply for exemptions. Some schools got exemptions, to keep watering their school gardens. But that wasn't available to households [Academic researcher, Melbourne].*

Water security emerged from this research as a major consideration when thinking of the nexus between urban agriculture, urban food security, climate change and urban resilience. However, as pointed out by one of the participants, there is a certain irony to the prevailing system of water allocations and restrictions, and how this is perceived by the wider community:

*Supposedly we've got a water shortage, and we've got people growing citrus orchards that are very unsustainable water-wise, and we're doing it in semi-arid,*

*half-desert environments. We're growing sugar cane, which uses massive quantities of water, in really dry areas. These growers are getting subsidised water: cotton is terrible, sugar-cane is worse [in terms of water usage]. We're also growing semi-aquatic rice, in the driest parts of Australia... There has been a lot of complaints by gardening groups, and calls for the government to give people in urban environments incentives to grow their own food, by giving them water at the same rate that the farmers get it. We're being charged a fortune for water here, but the irony is that 80% of all water usage is in [commercial] agriculture. Eight per cent is in urban environments, twelve per cent is industry. So while people are putting their toilets on half-flush and things like that, if you were to nuke all the urban centres and populations of Australia, you would only save yourself eight per cent of the water, which is really quite insignificant in the larger scale of things [Backyard gardener and permaculturalist, Melbourne].*

Climate change is however seen not only as a concern but also as an opportunity. For example, one of the commercial farmers we spoke with specialising in hydroponic production – saw their business as being significantly impacted by climate change, but in a positive way:

*With the igloos, we can control the temperature... So next year, we do want the heavy rain, we do want the crazy weather, because we know that the other farmers who use the traditional growing methods will struggle with that, and we won't. So climate changes actually work in our favour, the bad weather outside will cause production difficulties for other producers [but not for us]. For us, climate change is a market opportunity [Hydroponic market gardener, Melbourne].*

Similarly, but on a different scale, climate change did not seem to be a cause for fear in Queensland. A micro farmer on the Gold Coast suggested that small scale, diverse and local production might hold the key to food production under climate change scenarios, especially through the application of organic growing methods. This micro farmer explained that climate change was unlikely to affect his crops because of his emphasis on organic gardening techniques:

*I think more along the lines of what we're doing here is not [destructive], it's more regenerative than taking out of the system.... We make all our own soils. It's the soils that are the focus. Okay we use a fair bit of water I suppose, but the water use, because of the way we make the beds, the beds hold moisture really, really well and we're having a lot of organic matter in beds. We plant so that by the time the plants get up basically the whole bed's covered anyway. If you look at those beds out there, most of them are pretty close together and the soils not really exposed at all, so from a moisture perspective and from a rain perspective, climate change will not affect us [micro-farmer, Gold Coast].*

A founding member of Gold Coast Permaculture, explained that even if climate change affected his micro-farm, if there is a de-centralised system of small scale micro farms across the region, climate change would not be a problem:

*This sort of stuff here [Gold Coast Permaculture] addresses a lot of climate change issues. But there is just no way that we can live long like this, and there is nothing we can do to come back from the point that we are at. It does not mean*

*that we should just burn everything you know, and just keep going I just think that, if we build more resilient localised systems, more diverse systems, the more diverse, the more local, the more resilient, the better. If I have a garden here and it gets wiped out by climate change, my hope is that, there are five or ten gardens in other urban areas that will miss that and they can plant another crop or whatever. I mean sure it is nice to eat the food that we want to eat, but if it comes down to a food scarcity situation we are going to eat what we are given [micro-farmer, Gold Coast].*

Similarly, a backyard gardener from Melbourne expressed his vision of an expanding network of climate-adapted and resilient food forests through urban backyards, and outwards into suburban parks:

*What I've realised is that the next step beyond an individual's isolated food forest is to have many of these linked up. To have a sense of community where people share their produce. They all grow different produce, and share it between themselves. That evens out any sort of fluctuations in species, weather, climate conditions and everything else. It creates a more resilient production system. [Backyard gardener and permaculturalist, Melbourne]*

## **6 Urban agriculture and urban resilience**

Individual understanding of resilience in the urban context was summed up by 'adaptability', 'flexibility', 'preparedness', 'confidence', and 'increased skills'. Community groups spoke of 'social resilience' and 'connectedness', expressed through 'sharing and doing', 'networking', 're-skilling' and 'enhancing capabilities'.

*When you create space for people to come together, amazing things can happen...Council could encourage neighbours to steward a street... This has real potential [Not affiliated, Melbourne].*

A local government officer expanded:

*Resilience for me is the ability to decentralise systems – I see resilience as an evolution in action, creating opportunities for people to be actively engaging in a practice, growing food say, in a very localised sense that allows them to evolve the most appropriate systems for their particular needs, and their particular time. And I think it's something that needs to be inspired, because people will naturally do it. I see that as resiliency around food – people growing their own food locally, in their own neighbourhood, are like little life-rafts, little support networks, that are forming around growing and producing food; but more importantly, getting out of their houses, and co-living, sharing the burdens of life in a city, and life in general, in a neighbourhood. This is something that I know existed before - it hasn't existed in my lifetime, or at least in my experience, but it's something that I see as true resilience. When times become difficult, people, rather than go internally, come out [local government employee, Melbourne].*

Researchers tended to understand resilience from the perspective of social-ecological systems thinking. Brian Lake, research scientist and chair of the Resilience Alliance, defines resilience in terms of 'the capacity of a system to undergo change and still

retain its basic function and structure'. A resilient system is seen to include features such as:

- ecological, social and economic diversity;
- tight feedback loops;
- working with natural cycles;
- well-developed social networks and leadership, and high levels of trust;
- an emphasis on 'learning, experimentation, locally-developed rules and embracing change';
- institutions that include redundancy in their governance structures and a mix of common and private property with overlapping access rights; and,
- consideration of 'all of nature's un-priced services – such as carbon storage, water filtration and so on – in development proposals and assessments.

In Melbourne's urban agriculture and community food movement, there seems to be a view that the current globalised food system, because of its heavy dependence on fossil fuel inputs, and its high ecological footprint, is fundamentally non-resilient and vulnerable to systemic breakdowns or even collapse.

*A resilient food system, on the other hand, will, according to most interviewees, have a number of features that will enable it to cope with a variety of external and systemic shocks (climate change, Peak Oil); and also be capable of delivering fairness and social justice, for farmers and consumers.*

*A resilient food system would work from food production to consumption, retail and waste, and how we deal with that. A functioning, coherent system, would provide well for everybody in the population [Manager, NGO].*

Integrated planning frameworks were also mentioned:

*A resilient food system also means looking at retail and food service, so the outlets for food are accessible to people, are in the right locations, that they are affordable and provide a good mix of healthy options. It also means including the food service industry, which means tackling the whole question of fast food outlets [Manager, NGO].*

Urban agriculture is seen by interviewees as having a key role to play in building greater levels of urban resilience in general and climate resilience in particular. A common view is that localisation of food systems will be a key adaptation, together with a greater sense of shared and collective responsibility for the design of climate-ready urban food systems:

*Small and diverse will be the way to go. Food needs to be close to people; they will notice its needs and respond to it. They will understand the necessary adaptations that might be required, such as additional shade. There needs to be greater flexibility, greater understanding of local resources, and the taking of decisions collectively [Urban gardener and local food advocate].*

One of the emerging features of community-level urban agriculture in recent years has been food swaps. A backyard gardener emphasised the essential role that strong community relationships and networks have to play in terms of creating a resilient urban food system:

*These are key in terms of increasing the variety of local food you can access, especially if you're renting, and you can grow short-term crops and swap them for longer-term crops that you can't grow. The food swaps fill a really critical niche, in terms of a resilient local food system. They are a great social network... we have fantastic social networks in our community, constantly swapping and gifting produce. [Backyard gardener and permaculturalist, Melbourne].*

## **7 Barriers to urban agriculture**

The principal political barrier to the expansion of urban agriculture is the perceived lack of any strategic vision for a sustainable and resilient food system, in the two case study cities or their respective estates. This expresses itself most acutely in relation to the expansion of the urban growth boundary over prime farmland in Melbourne; but it is seen more broadly in the failure to fully integrate considerations of health and well-being into state and federal planning and policy frameworks.

The previous government of Victoria (the Brumby administration) attempted to establish a state-wide, whole-of-government, integrated food policy. Some interviewees suggested that this policy initiative 'ran into the sands of obstructionism' from within the Department of Primary Industries which was not convinced of the need for it.

*So we had a reasonable commitment to doing this. But it really just dragged, and when I look back now to some of the stuff we'd come up with, and had committed to in regional policy and climate change food strategy, the whole-of-government food strategy. We understood why we're doing it, and it had strong links to climate change, and everything else – now we know that DPI was just basically stalling it, at every possible opportunity. You'd have everything agreed, everyone on side, and then you'd get this memo, saying, you can't have this, why don't you re-write that. And we'd be completely back to scratch. And there was just dragging of feet – so much time and energy going into something, that it was almost like a plaything at one level. They had to be forced. If the political will's not there to really make it happen, it doesn't matter how much pushing you do from the policy officer level. There was an incredible educational process for the people involved. We took that many people from traditional DPI, who thought that food security is just about choice, and if people are fat, it's because they're eating the wrong food, through so many discussions of explaining, opening people's heads...I'm sure it had a lot of educational benefits for a lot of people, but ultimately it didn't deliver anything on the ground [Former state government employee, Melbourne].*

Reflecting on the failure of this attempt to establish an integrated and holistic state-wide food policy for Victoria, which would, amongst other things, have accorded a prominent role to urban and peri-urban agriculture, and in particular to the protection of prime farmland close to the city, this interviewee identified a culture inside the State government, especially at more senior levels, which strongly militated against policy change of this nature:

*People would just say, agriculture's DPI, but that wasn't what I was talking about. So I really began to see how this handballing phenomenon worked inside*

*government; and that trying to get people to talk about complex issues who didn't have clear lines of responsibility was very difficult. You can get those conversations happening at officer level, and maybe at manager level, but it's very hard to get real openness to people above that [level] thinking outside the box [Former state government employee, Melbourne].*

In Queensland, the Newman government has commissioned an inquiry into the state's agricultural and resource industries, and this focuses primarily on identifying and removing unnecessary regulatory barriers, and there is little recognition of land use conflicts except in relation to tensions between farmers and miners in, for example, the Darling Downs.

At the local government planning level there also seem to be a general lack of awareness and a complacency around food, translating into a barrier to the greater expansion of urban and peri-urban agriculture; and more broadly to the construction of a sustainable and resilient food system:

*There is a lack of awareness of the importance that food can play in community development, within the system that's making the decisions. Food's always been at the heart of community development, it was at the basis of human community development, 8,000 years ago when [agriculture and civilisation] first emerged. But it's something that's relatively [absent] from planning schemes and language, in that whole sector of planning and community development, it hasn't quite emerged as a priority. That's one of the main drivers behind [food insecurity], that food doesn't have a place at the table when major decisions are being made... It goes to this assumption that our food system will always come from somewhere else. That seems to be a story that's guaranteed by government, or private industry, which says that we'll always be able to go elsewhere to source our food. But that's not a tested theory. It's just an assumption that's been made [Local government employee, Melbourne].*

Adding another dimension to the lack of political support for urban agriculture are the existing regulatory regimes and policies that provide on the ground obstacles to the realisation and expansion of urban agriculture practises across Australia. On the Gold Coast for example, much attention has been placed on the Council's commitment to have 100 community gardens by 2020, but, as expressed by some interviewees, that target will struggle to come to fruition based on their own experience of dealing with Council and its policies:

*We started [the Ashmore community garden project] in 2010... However, over that time the specifications for what we needed to achieve to be eligible to get the garden had changed... [Then, council told us] it's probably better to look at the community gardens starting kit, but I don't think that's the current process anyway because we keep being told that there are new processes being developed and new procedures ... Like in the past we've worked to what council tells us and then they change their mind once you've done it [saying] 'oh that's great but you shouldn't have done it' [Community gardener, Gold Coast].*

In an attempt to address the lack of guidance and the confusing nature of community garden planning presented above, the newly elected Gold Coast City Council has

recently reissued their community garden policy, however this has turned an unclear situation into a bad policy framework:

*The new council withdrew all the funding for the community gardens, so it's just a shot through the head. But at the same time the policy from council is very rigid, where it has to be between 1200 and 1800m<sup>2</sup> it has to be this and that. [The policy says that] every community garden has to be 1800m and it has to have 40 beds because it was suggested, but when it was written into policy it was locked in, as if one size fits all. Whereas across the road might have a lovely little bit of park and there might be four or five people in those units who would be willing to take control of that little bit of park (that has never been used for anything), but Council will not support that community garden because it does not fit within that policy framework [Community gardener and permaculturalist, Gold Coast].*

Another illustration of the impact of regulation was given by an organic farmer in Queensland:

*You had the egg argument, it's just so ludicrous. The regulations are about stamping every egg so you know where it comes from. And what it does is it favours the cage bird rather than free range.[...] We had a guy who ran a poultry farm on the edge of the mountain and brought his eggs to sell at the Green Shed and they were certified organic and free range, and the egg police came and said he couldn't sell his eggs at the shed, he'd broken several regulations the main one of which is that he didn't have them registered with the egg police and put a stamp on the eggs saying where they were grown. And if he kept doing it he'd get a \$30,000 fine or go to jail for two years. And so when they came back to check he said I don't have a poultry farm and he'd burned all of his chooks. He was so overcome by it all he just gave up and he burned all the chooks.*

*It's a Queensland thing, the Queensland regulations on eggs are worse than other states. We could actually sell at the Green Shed eggs that were grown in Lismore, New South Wales. We could sell Lismore eggs, we're allowed to do that but not Queensland eggs [Organic Farmer, Gold Coast]*

It is known that the Federal Government is currently in the process of preparing a first-ever National Food Plan, but there was little belief amongst our interviewees that this will result in a holistic and integrated policy document, or that it will give a place to urban and peri-urban agriculture.

Economically, one of the main concerns expressed by many participants is the loss of prime farmland to residential development in surrounding urban centres. This refers not only to the physical construction of houses but the amount of land that is left idle due to speculation and land banking. More notably in Melbourne, interviewees suggested that an increasing number of individuals and companies have purchased land on Melbourne's peri-urban fringes, often with the expectation that the urban growth boundary will be expanded, and the land will increase in value in the future. An older dairy farmer from the Mornington Peninsula expressed his concern on the topic of urban expansion.

*The good sandy soil is beginning to run out [due to urban expansion]. There's a lack of water further south (into Gippsland), and reliable water is essential to commercial agriculture. The urban expansion of Melbourne should take place to*



*the north and the west, where it won't have such a big impact on farming [farmer, Melbourne].*

A current peri-urban farmer appeared to have lost hope and saw urban expansion as inevitable:

*It's silly for anyone to try to stop urban growth...The infrastructure's there, and they've got to build continually to expand the city...That's a given, you can't really stop that [Market gardener, Melbourne].*

This concern is justifiable given the current school of thought within state governments:

*They [politicians and senior bureaucrats] place zero importance [on peri-urban and urban agriculture]. It's totally disregarded...That's a reflection of a market orientation that also applies across Victoria. The focus, and the concern, is with returns to the private sector...for years, the 'dry economists' in [the] policy groups have only ever wanted to include statements which say that 'the market determines the land uses'. It wasn't written, but it was the practice. You can trace that to ideology. It's clearly a conservative ideology...we now have a situation in Victoria, and the same is true across Australia, in which there are less and less clearly stated policies and regulations, and decisions are taken on the assumption that if you don't allow a particular development to go ahead, you're preventing economic development, job creation and so on. [State government employee, Melbourne].*

Additionally, the impact of increasing foreign acquisition and ownership of agricultural land was also raised by some growers, as a threat and a barrier to the further expansion of urban and peri-urban agriculture:

*I think it needs addressing that overseas interests are buying up huge chunks of land in Australia. I know they can't take it anywhere, but they are certainly securing their future agricultural industries for their own countries. I certainly see this as detrimental to our future generations [Market gardener, Melbourne].*

Another interviewee elaborated on the impact that foreign acquisition of farms is having on Melbourne's periphery:

*There is a gulf between the discourse of trade-based food security which is what the DPI and the Federal government work with; and community food security which we work with. But even at the macro level, there's a not a great understanding because the Federal government is allowing the Chinese to come in and buy all our best agricultural land, which in Australia is in short supply...The Federal government is allowing other countries to come in and buy our best agricultural land, on the edge of Melbourne, so they can export food to their own people. Not only that, but the [state] government is allowing the Green Wedge around Melbourne, Sydney and Brisbane... allowing all that lovely fertile land to be planted with cement. The government doesn't get it! [Independent researcher, Melbourne].*

Interviewees also pointed to the issue of corporate domination of the food system, and its impact on farmers, suppliers and consumers. The so called 'cost-price squeeze' on farmers was mentioned numerous times as a matter of concern, which makes farming unviable, especially for smaller operators, and impacts on the long term viability of peri-

urban farms. The 'cost prize squeeze' refers to a situation where simultaneously the cost of inputs rise, the burdens of regulation increase and the market dominance of the supermarket duopoly in Australia has leads to falling farm gate prices, which result in farmers, specially smaller ones, being driven out of business. One farmer described the dairy sector in these terms:

*There are basically three sectors in this industry: the good operators, with low levels of debt; the good operators, with high levels of debt; and those for whom it's just a struggle. That last group tends to be younger people, and they get very little returns. The demographics of farmers show that we're getting older. The industry has gone through a huge rationalisation: there were 33,000 dairy farmers in Victoria in the 1970s; now the country as a whole has 17,000. Two-thirds of the dairy farms in Gippsland have disappeared [Farmer, Melbourne].*

For this farmer, the regulatory burdens constituted 'death by a thousand cuts':

*It's not any one thing – it's everything together. There's the cost of rural wages, and all the on-costs: super, Workcover, payroll tax. And then there's taxes on taxes, like the fire service levy, and parental leave. Four departments take their levies out of the milk cheque. The carbon tax will impact on our power costs, our fuel and transport. Then we have multiple audits of the milk factory, by the MLA, and the EPA, and Food Standards. Food safety is necessary, but the red tape is very difficult. There's no one-stop department, and reform doesn't happen, because bureaucrats have a vested interest in keeping things the way they are [Farmer, Melbourne].*

In the same vein, a smaller-scale market gardener from Casey-Cardinia commented on the pressures and burdens she and her husband faced in their business:

*Probably fuel and labour costs. Some of the regulations are a fair call, and some are simply odd ... Paper shuffling (although necessary to some degree) is time consuming and not a priority of how we like to run our business, so the less the better as our occupation is very physical and we are not always educated to deal with some of the paper and jargon related to regulations. I personally think Australia is paranoid about regulations – we live in a clean green country and I would like to see imported produce from China regulated and not given random regulation on a percentage of produce but the whole lot, just like we are accountable, it is totally contradictory [Market gardener, Melbourne].*

Similarly, in and around the Gold Coast, local growers expressed similar concerns about the burden of regulation and about the low margins that exist for many producers. A representative of Queensland farmers observes:

*It is imperative that famers can compete on an equitable playing field..[however]..it appears that in recent years the pendulum has swung away from Australian famers [Non-government organisation, Gold Coast].*

The corporate domination of the Australian food system leads to the third barrier identified by interviewees, namely cultural factors. One is the prevailing culture of cheap food, and the convenience of take-away, which can lead to widespread complacency about food, its provenance and availability as well as about issues of waste:

*Why do people buy so much food that they throw out? Why is there such a disregard for food? If you could turn that into dollars, people would certainly have a concern about how much they were throwing away [Local government Employee, Melbourne].*

People living in cities often face a 'no time' or 'too busy' culture. The pressures associated with social life and work may pose a risk to the development of urban agriculture, simply because it becomes 'too hard':

*It's just such a complex issue because people probably would like the idea of having local fresh organic produce but when it comes to the fact that they need to put the effort in they have all these other commitments on their time: they have kids, they have work, they want to watch their favourite TV show - and I think you just have to have a culture change, not only on an individual level, you're going to have to have it on a business level as well [Micro farmer, Gold Coast].*

This leads to another aspect of the cultural barrier which participants identified – a widespread lack of awareness of the key issues and problems concerning the food system, and engagement with them:

*There is a real lack of awareness of the need to change. Most of the population is not aware. People need to be more uncomfortable, or have barriers to action removed, such as cost incentives. It's really troubling that so many people don't have basic food growing and preparation skills. And this applies across the wider population – we're lacking basic cooking, and food preparation, and preserving skills. There's a psychological shift that needs to happen, for people in general to value food growing as a worthy thing to do. People forget that there's a farmer behind every meal they eat [Backyard gardener and Permaculturalist, Melbourne].*

Many interviewees commented that some of the difficulties around urban agriculture are related to the fact that most people are simply disconnected from the natural environment:

*Look, we are so far removed from growing our own food and being self-sufficient that people think that it's disgusting that you grow your own food. Like, I'll bring in my lettuce or something from home, I've had comments from work saying 'oh, bugs and all' you know 'oh there's a bit of dirt on it'. People are so far removed from that...people don't understand that growing your own food is a very valuable thing to do and gives you a sense of pride, they see it as something that only dirty hippies would do [NGO Employee, Gold Coast].*

Lack of knowledge and information can also be an internal barrier, as even when people are interested in growing their own food, they often do not seem to know how to get started:

*Most of them are totally ignorant. They haven't got a clue about farming organically... It's quite fascinating and really quite amazing. Yeah, a few people think they know a bit but in practise... It's a difficult thing for people to grasp, they think that you can just go from chemical to organic and there's a similar solution, it's just an organic solution [Organic farmer, Gold Coast].*

Another issue that was mentioned by almost all interviewees in the inner urban context was soil contamination. The widespread perception, substantiated by testing carried out in several areas, is that most of inner urban areas of Melbourne has soil contaminated with lead and other toxins used in industrial processes, and in lead paints that were common in the first half of the 20<sup>th</sup> century:

*It was a big issue with this house, because the side wall on the adjoining property was painted with lead paint, and we spent a long time negotiating with [our neighbours] to do something about it, and eventually had to get council involved. The paint was flaking off and we found it all through our soil. The neighbours have now capped the wall with a vinyl covering. We couldn't do anything until they'd done that, and then we had really serious lead contamination.*

*It's such a big issue, there's so many gardeners growing vegies under paint walls, and I've done it myself, before I became aware. We need much greater awareness and research about this. You pretty much have to assume that you've got contaminated soil, and that's most of inner Melbourne – but that's where we're at [Backyard gardener and permaculturalist, Melbourne].*

As discussed below, there are ways of addressing this issue, but at the moment they fall on each individuals' shoulders in the case of backyard gardeners; and on community and school groups, as regards community and school gardens. Soil testing is expensive, and building up raised beds is a further, sometimes considerable, expense.

Another barrier identified was the emergence in recent years of a backlash against community gardening in public parks in the form of a growing 'open space' lobby, whose members see community gardening in public spaces as a form of appropriating public land for essentially private use.

To illustrate these challenges, we offer a short case study of an attempt to set up a community garden and describe some of the barriers in practice faced by a group of local enthusiasts, even in an environment where support was forthcoming, in principle, from local government.

As part of its promotion of 'an active and healthy community', Gold Coast City Council promotes community gardens as a way of increasing food security in the city and has prepared a Community Gardens Start Up Kit for groups wanting to develop such a local initiative. Linked to this process of support, the Council appointed a dedicated worker to liaise with local groups planning a community garden and a number of Divisional Councillors allocated funds from their Divisional budgets to support initiatives in their communities.

One such group formed after their Divisional Councillor called a public meeting to promote the idea of a community garden in the Division. They were pleased to learn that 'all we had to do was form a steering group and get 14 members signed up', which they achieved quickly. However, they then discovered that they would either have to become an incorporated body or exist under the auspices of a relevant existing body, such as a large community based, not-for-profit organisation. As the auspicing option seemed most convenient, they then approached a large national organisation with a significant presence on the Gold Coast, who agreed to act in this capacity. They then learned that this body was deemed by the Council not to be primarily concerned with

urban agriculture (however broadly defined) and hence not suitable as an auspicing organisation. The embryonic group then decided to incorporate, with the help of a local food activist with experience of setting up local groups.

The newly incorporated group were offered two possible sites for their garden by Council, from which they chose one, and the Community Gardens support office acknowledged the preferred site and suggested, '...it's ready to go, you might need to talk to some of the users to say this is happening and if you can get some support from the community that would be great'. However, they were then told that the chosen site was no longer suitable. The group decided to search all other public parks in the neighbourhood in order to choose those that seemed to best suit their needs and preferences.

Having identified a preferred site, the group began to work with the support officer to draw up plans for the garden itself:

*'..so we were looking at our site and X had helped us draw up our plan and everyone was getting very excited , it seemed very real and we were told – you know you have to go out and quotes for all the different parts of the garden – so we'd formed sub-committees that were looking at the price of a fence and all the bits and pieces and then we were told – oh no, sorry, you can't have this site because its Q100 flood zone and therefore you can't have any built structures in the area at all'.*

The group then met with the Divisional Councillor and the latest support worker to review all the parks in the Division and identified one that appeared suitable, although with the added complication that it was a State park and would require a development application. As part of this process the Council wrote to local residents notifying them of the proposal to establish a community garden within the park:

*'..the residents of X Park called a public meeting, which some of us attended, and the residents were extremely aggressive and they were really feeding off each other and getting very, very upset about the situation...[they were saying that] it was going to bring down property prices and there was somebody there who worked in a real estate agent's saying this again and again so they really picked that up. And then one of our members was actually accosted [by someone] who said – you won't get a garden there over my dead body, I don't want you hippies coming in selling your drugs and turning my kids into druggies – so that was very hard for some of our members because most of them are older and retired... Most of them are not gardeners at all...a lot of the regular members are single women, older, around 60 [Community gardener, Gold Coast].*

After this meeting it was clear to the group that this site was not viable because of the intensity of local opposition and they agreed instead to invite a council officer from Gold Coast Parks to attend one of their meetings to talk about what might happen next. This had not occurred at the time of the interview and the group now rents a plot at a site run by Gold Coast Permaculture so that those keen to grow food are able to do so.

The experience of dealing with the Council has not been especially encouraging for the group, although they recognise that support has been forthcoming from both officers and Councillors. The main problems appear to have been in relation to communication and to joined-up local governance (or lack of it). It appears that a consistent message

about what is possible and where it might be possible has not been forthcoming from Council. This may well reflect a lack of communication between different sections of Council. There is also evidence of a somewhat heavy handed regulatory approach, again compounded on occasions by poor communication. For example, in planning the fencing for their garden the group was required to obtain a number of quotes for their preferred fencing, but ultimately discovered, ‘..oh you can have any style of fence you want, but it has to be three foot high with black mesh!’.

The group also experienced significant problems in planning for toilet facilities, as one of the designs presented to them (by one of the support officers) was for vegetable beds accessible to people in wheelchairs. This in turn triggered a requirement to provide a toilet accessible to disabled people and a debate about the scope for providing a composting toilet that also met this requirement. The point is not that the group was opposed to making the garden accessible or that they were insistent on a composting toilet, but rather that what was acceptable or not to the Council was never made entirely clear to the group.

These issues were compounded by the group adopting a highly participatory style of organisation, which of necessity required meetings of the membership to determine their requirements and preferences. Unsurprisingly, after over two years of planning for a community garden but not achieving one, the active membership of the group dwindled to around 10–20, out of a total membership of around 90. And some active members were concerned that their initial reasons for joining were not being fulfilled:

*I joined the garden to be outside and to talk to people; I seem to spend most of my time sitting in front of the computer screen doing the administration for it  
[Community gardener, Gold Coast].*

This short case study illustrates how the best of intentions from a variety of prospective partners do not always lead to successful outcomes and may even frustrate people with valuable enthusiasm. If Gold Coast City Council is to realise its ambition of supporting a city wide network of productive and flourishing community gardens and to extend this support to other forms of urban agriculture then it must re-state the political commitment to this aspect of its city building ambitions, ensure that different parts of the Council work more effectively together and allocate sufficient funds to make a difference. A review of local regulatory regimes to determine their impact on small scale urban agriculture would also be welcome.

## **8 Overcoming the barriers**

Despite the numerous barriers pointed out by participants to the development of urban agriculture in the case study cities, they were able to suggest many ways of addressing them. Common suggestions included: education about the practice of gardening at all levels, integration of policies and activities by local governments, political leadership, funding and staff resources at local government level, diversification of activities, independence, collaboration and coordination.

Education at all levels of society seems to be paramount for the development of better urban agricultural practices. Politicians, public servants, NGO’s, gardeners, the general community, must all be educated about urban agriculture: its practices, requirements,

benefits and risks. Before we can confidently state what role urban agriculture has to play in meeting urban food security and climate change challenges, there is a clear need for more quantitative and qualitative data:

*Urban agriculture is very important for cities of the future. But we don't yet know enough about it to take objective decisions, informed by adequate evidence and data. We need a proper research program to find out what we need to know, especially as regards yields, and effective systems [Academic researcher, Melbourne].*

Interviewees were well versed in the prevailing political realities of the case study cities and states, which are not especially supportive of urban agriculture. When interviewees were asked about how their ideas for change might actually come about, many pointed to the need for an educated and motivated populace to put pressure on their political leaders:

*We need to create the space for government to move. For that to happen, the public needs to see food as more important; and so we need much greater understanding amongst the general public of the issues around food production, climate change, fair food, and so on. More understanding than exists now, in order to move government along [Academic researcher, Melbourne].*

The lack of knowledge and awareness was constantly pointed out in the interviews as major barrier for both the would-be grower and the rest of the community. Consequently, an important way to address this barrier would be the provision of more high quality information in general, and more specific training in various aspects of food growing:

*The training is vital. If you can't actually keep your plants alive and produce good stuff then it's going to be harder to keep people together [Farmer, Gold Coast].*

Organisations like the Organic Growers Association, CERES, Gold Coast Permaculture and many others hold the key to increasing capacity and helping to disseminate their knowledge through successfully growing organic crops:

*We recognised this [lack of training] this year and we had another program with the Salvation Army here where we trained people on a 20 week course involving biological composting, garden planting and all the basic sort of stuff, and that's part of the work for the dole program, so rather than just coming in and doing some labouring work, there was a good opportunity for us to give them some skills as well and make it a bit more meaningful. And the idea was that these people would then go back to the school program and teach the parents and teacher about biological composting and proper planting stuff just to address that lack of knowledge [Micro farmer, Gold Coast].*

Inspiration could also go a long way in the education and dissemination process. Interviewees have suggested that well run urban agricultural sites can not only produce good and affordable food, but they also inspire people and demonstrate what urban agriculture really is, what it is not and what it is capable of achieving:

*It's a kind of inspiration as well. It's the inspiration, you've got to have the inspiration. You've got to inspire to make or break people. You u need to inspire and motivate. Every school should have a garden. Not only have a garden but*

*should teach gardening to parents, never mind the kids. Parents need to learn...Hospitals, universities you know [Farmer, Gold Coast].*

Part of this learning process is to educate our political leaders about the need for better integrated policies. That is, urban agriculture and the food system are not only about food production, or food retailing, but are concerned with the myriad of activities at different scales that contribute to a healthy urban agriculture network. A common suggestion is the creation of Food Policy Councils, which are being established in a number of North American cities. Food Policy Councils, bring stakeholders from different food sectors together to examine how the food system operates and how it can be improved. Food Policy Councils also educate public officials and the public, draft food policies and coordinate between local and often disparate food programs.

VicHealth is currently supporting the establishment of 'Local Food Policy Coalitions' that will bring together over a dozen local councils in Melbourne and some regional areas and will include a range of community-based stakeholders. The opportunity exists for these Coalitions in turn to be connected through formal coordination mechanisms. This can feed into the existing policy and community work already underway in a number of local governments, and facilitate exchanges between inner urban and peri-urban councils:

*Everyone's doing a little bit at this point, and I think eventually it's going to hit that watershed point, where a peak body will form, and there will be some very significant movements, if the political will stays. Because that's what's driving it. A peak body will be a formal inter-council coordination mechanism. It exists informally at the moment with all the officers who have responsibilities related to urban agriculture getting together [Local government employee, Melbourne].*

Drawing on his experience in the United States, one local government officer in Melbourne also highlighted the dynamic synergies that can occur between local government and community organisations and how together they can strengthen the shift towards a more sustainable and secure food system:

*There's great work being done in the States by an organisation called the Ag Innovations Network, based in San Francisco. They're taking it county by county, a multi-stakeholder approach, getting some key things locked in, around sustainable agriculture, water protection, all these different things. Working with farmers, producers – they're building a network, county-by-county-by-county, and eventually, you pull the strings, and the whole State is seized up in that process. And you've shifted the paradigm.*

*So for me, the local council is the driving [force], but it has to have strong participation from that non-government side of things. As the risk-taker, as the facilitator, as the experimenter – that's the power of the non-profit, they can give it a go, and they can crash and burn, and their accountability is much less severe than it is at council level, which has to answer to ratepayers, the media, and so on. That partnership, that edge between the two, is a very dynamic edge that I think needs to be strategically, and significantly developed [Local government employee, Melbourne].*



Another important and tangible role that local governments can play to demonstrate leadership and commitment to local urban agricultural practices is through the adoption of procurement policies that support locally grown food:

*This would be government sending a clear signal, and creating demand for such foods. By setting standards about public procurement, it won't be the sole answer, but could stimulate production to meet those requirements. At the moment we don't have any – and we need them. That would cover health, and ethical, sustainably-produced food. There are different approaches as to how this can be done. In the United Kingdom, there are government procurement standards for national departments, for example, eggs must be free-range, certain proportions of coffee and tea must be fair-trade, certain proportions of food must be sustainably grown, and so on [Academic researcher, Melbourne].*

Similarly, there are policies in place which incidentally support urban agricultural practices. On the Gold Coast, Gold Coast Permaculture proposed the diversion of part of the aquatic weed waste taken from the many water bodies from the city to its site to be composted. In that way, a material perceived to be waste is not only re-used but is also used as a micro-business opportunity as the excess compost can be sold to the general community. However this process is not as easy and simple as it seems:

*We divert waste streams from the Gold Coast City Council. We take their aquatic weed and we take their woodchip because normally they'd dump that in a tip. They tip all their aquatic weed, about almost 1200 tonnes a year, into landfill and so we've taken about, I guess, 500 cubic metres of that stuff so far; which is a significant amount and we compost it... But now Council is saying, 'Oh hang on, there are competition rules out there that say, we can't give this to you, all this water weed,' seriously, 'So we've got to tip it.' I mean how dumb is that? But yeah, council won't give it to us because they think it's against competition policy. There's a competition policy out there that all councils have to follow, which is totally nuts. So they'd rather dump it than give it to us [Micro farmer, Gold Coast].*

The cost-price squeeze and the power of supermarkets were mentioned by commercial growers and others as a significant barrier. One way of addressing this is by the supporting diversified distribution and retail outlets. Farmers' markets, supported by the Victorian Farmers' Markets certification scheme, have expanded significantly in Melbourne and beyond in the past decade. On the Gold Coast, there is now a significant network of markets with plans for further growth. New distribution models similarly based around more direct forms of exchange between producers and consumers are also being trialled and scoped - CERES FairFood, Gold Coast Permaculture and the Casey Food Hub project, are all examples of this model.

Land access and soil contamination were also major concerns for the expansion of agricultural practices within cities, especially in the inner parts of Melbourne, where land is scarce and known to be contaminated from previous land uses. With regard to the issue of soil contamination, interviewees recommended that rather than leaving this to individuals and community groups, a more systemic approach was required. It was suggested that local governments should carry out audits of public land that might potentially be used for food production in order to identify levels and types of contamination. Another proposal involved the allocation of extra resources within

existing Council's water testing facilities, where people could take their soil, compost and water samples for comprehensive testing.

*It's a big problem for us is the science....It's prohibitive. So testing for pesticides and stuff, what we usually do is I'll give a call to Biosecurity Queensland or the Gold Coast City Council or we might ring you guys [University] and say, 'Is there any possibility of you guys doing that for us? This is what we're doing,' and we set that sort of situation up. If the health and safety of the population [is to be considered] which is the first point of call for us, then they have to have a rigorous testing standard and they have to do that. So it's probably going to be more cost-effective for them to employ someone in council that's qualified to do all of that, because the wastewater treatment guys already do a lot of this stuff anyway. So it's probably going to be more cost-effective for them to just put someone in there and say, 'That's the go to sort of person that will test the compost and test this and test that,' and then it becomes a really streamlined, clean system as well [Micro farmer, Gold Coast].*

At the same time, it was suggested that research should be carried out on the best ways to remediate contaminated land, and on what plants are safe to grow and eat, following different levels and types of contamination. Some individual gardeners reported that fruiting trees are much less likely to take up contaminants in the soil and pass them through to the edible parts of plants, than are leafy green vegetables. Consequently, a possible response would be to promote plants that do not take up soil contaminants, recognising that such a promotional campaign would require expert scientific input on appropriate species from the outset. Furthermore, local governments could facilitate through grants, resource sharing and knowledge, the use of alternative growing mediums such as raised beds, planter boxes and straw bale systems.

Land use invariably become a major talking point when urban agriculture was discussed, because of the lack of land available for urban agriculture, or the use of public owned land for community gardening, or because of potential nuisance associated with keeping animals. In terms of opposition to the further expansion of community gardening, the food forest model appeared to offer a potential way forward. The advantage of a food forest over traditional allotment-style community gardens is that because they consist of trees, they do not prevent other activities, such as dog-walking and picnicking from taking place in the same vicinity. The model has yet to be tested on any significant scale, although a proposal is currently being negotiated with Darebin Council in Melbourne to create a food forest in a section of All Nations Park. On the Gold Coast, numerous grassed, underutilized parks exist within the city, and a proportion of them could, in principle, be devoted to food forest experiments.

As an alternative to the perceived lack of urban land and the fear of losing public parks to food growing activities and enterprises, the innovative way in which Gold Coast Permaculture currently grows food and runs a successful micro-business – through the temporary leasing of private land offers a model for other urban food growers. In most Australian cities, many opportunities exist for non-permanent food production enterprises to take over land on a temporary basis:

*Developers are sitting on just thousands of hectares of space everywhere around Australia and there's really no reason why a lot of that land can't be given over to groups to grow food. We could replicate this place half a dozen times down the*

*coast without any problems whatsoever, if we just had some developers saying, 'Well, I've got 2,000 square metres here and I'm not going to do anything with it for 12 months. Come and garden it.' A; it's going to save them money to maintain it and B; people get a lot of benefit out of it. Space is there and even if it was only used for 12 months, it's still worth the time put in, to get in there and do the gardens [Micro farmer, Gold Coast].*

A proposed solution to facilitate the usage of private lands on a mutually beneficial basis is through the temporary donation of a piece of land to a community organisation, something that Gold Coast permaculture is also starting to pursue:

*In order to start locking away some of this private land, we are trying to aim for DGR [deductible gift recipient] status, so we can go to these corporations who are not going to use these lands for years, and we can say 'how about you take a tax break by donating that to us' [Micro farmer, Gold Coast].*

Lastly, funding was always on the agenda of interviewees as a major barrier to the development and expansion of urban agriculture, in particular to the creation and management of community gardens. To reduce this financial burden on local government, the approach taken by Gold Coast Permaculture is worthy of wider consideration: in addition to community garden beds, micro-enterprises generate enough funds through the sale of vegetables, honey and compost to keep the whole site solvent, without the need for subsidies from the Council.

*We are not reliant on the council so much. If we can get a grant, that's great. It means, okay, we can buy this and that - we can buy some more hives. [But the important thing is that] we understand that the council has to identify and cut costs to put the budget in line, and we think that we can identify savings, in particular through diverting waste streams, so that means that system can get up and running again [Micro farmer, Gold Coast].*

A major obstacle for many community gardens in Australia is that in most local government areas community gardens are not allowed to sell any of their produce, which significantly impedes their economic viability and independence. A simple solution would see Councils allowing community gardens to sell some of their produce for fund raising purposes.

*The other thing is that you cannot sell anything from community gardens so you are instantly keeping it on the tip, you know, so if you make them independent you allow them to rent their space out, to rent their shed out to make 20 dollars. You don't need much to run a community garden, make it ok for them to sell plant or excess produce. Simple! [Community gardener, Gold Coast].*

## 9 Conclusions

The case studies were designed to explore in greater depth and with practitioners and policy makers the key issues emerging from the literature review. The review drew on material from around the world and we wanted to allow local practitioners to have the opportunity to both contextualise and criticise concepts and propositions developed elsewhere.

All of those with whom we spoke were willing and able to engage in this critical reflection, regardless of their particular appreciation of climate change or urban food growing. The workshop in Melbourne offered an additional and valuable opportunity to hear debate among a group of practitioners as well as their individual perspectives.

Overall, the interviews revealed that practitioners and local policy makers working in this field are typically committed to urban agriculture and see significant potential for its expansion. They recognise the barriers such expansion faces but also see opportunities for overcoming these barriers. In many respects this is to be expected from those already working in a particular field, but many of the interviewees also expressed criticism of some of the conceptualisations of food security, of urban agriculture and of occasionally naive attempts at small scale commercial food production in cities.

To some extent the interviewees also reflected a broader divide apparent in wider debates about food security, urban agriculture and urban resilience. To many Australians, food production is something that takes place only in rural areas and while there is growing recognition of the challenges faced by many small farmers in particular, there is an underlying optimism in the capacity of market mechanisms and technological developments to ensure that Australia remains a producer of food surpluses and indeed derives much of its national wealth from the export of food. From this perspective, urban agriculture is something of novelty and although long standing traditions of self-provisioning through suburban backyard gardening remain, commercial and collective provision in cities is seen as a minority pastime, similar to hobby farming in peri-urban areas. However, a growing body of opinion recognises a number of significant and substantial threats to food security in the cities of the developed world, including climate change, the consequences of peak oil and global economic crises. From this perspective cities must develop a range of new approaches to planning for their futures which seek to build resilience. The re-localisation of food systems through support for urban agriculture is one measure in building greater urban resilience, but must be pursued in tandem with many others including the productive use of urban waste, the development of decentralised energy production and distribution systems and the construction of more compact and flexible settlement patterns.

In illustrating these contrasting and sometimes conflicting views and opinions, the case studies have provided valuable insights on the debates that currently exist around urban agriculture and the policy debates that must continue if Australian cities are to become more resilient in the face of climate change.

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