MELBOURNE URBAN BACKYARD FOOD PRODUCTION: HOW MUCH AND HOW?

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<tbody>
<tr>
<td>CBD</td>
<td>Central Business District</td>
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<tr>
<td>CSA</td>
<td>Community-Supported Agriculture</td>
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<tr>
<td>DPCD</td>
<td>Department of Public and Community Development</td>
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<tr>
<td>GE</td>
<td>Genetically Engineered</td>
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<td>GMO</td>
<td>Genetically Modified Organism</td>
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<td>MEFL</td>
<td>Moreland Energy Foundation Limited</td>
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<td>MFGN</td>
<td>Moreland Food Gardens Network</td>
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<td>NGO</td>
<td>Non-Government Organisation</td>
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<td>SSS</td>
<td>Swap Share Shuffle</td>
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<td>UGB</td>
<td>Urban Growth Boundary</td>
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<td>UN-HABITAT</td>
<td>United Nations Human Settlements Program</td>
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ABSTRACT

Food intersects all aspects of human life. It sustains and nourishes human bodies. It provides jobs for many people on this planet. Regardless of cultural practices, religious beliefs and political ideologies, every one of us needs to eat. Food is central to well being and survival and yet many people, particularly those in the cities, are disconnected to food; where it comes from and how it is produced. According to the United Nations by 2050, 86 per cent of the population will live in cities, and cities are expected to grow to accommodate the projected growth. This causes many issues around food production and food security for urban dwellers. The thesis aims to explore a food production alternative, namely urban backyard food production. In doing so, it is an attempt to help address the urban food security issue and make a small contribution to the ongoing dialogue on food security in relation to peak oil and climate change.
This statement is to confirm that the work presented:

a) is that of the candidate alone except where due acknowledgment has been made: and  
b) has not been submitted previously, in whole or in part, to qualify for any other academic award.

Signed: ........................

Date: ........................
Chapter 1. Introduction

1.1 Background and context of the research

Food is an integral part of our existence on this planet. In affluent western countries, the consumption of food is something we all do every day and often taken for granted. We consume food many times a day in many variations. Much of our daily ritual revolves around the preparation and/or consumption of food. It is so basic and yet there is a dissonance between the consumers and producers of food at many different levels. For the average urban dweller supermarkets equate to food. Restaurants and fast-food outlets equate to food. There is a disconnect between how food is produced, where it comes from, and how it reaches us (Moore Lappé 1982; Pertini 2007; Pollan 2008; Cribb 2010; Clapp 2012).

There is so much more to food than meets the eye. It is a fundamental cultural and social aspect of our society. It is an evolving living history that is forever being shaped and formed by both political and commercial influences and, of late, by environmental influences – peak oil and climate change.

1.2 Statement of the problem

In the last 30 years, the nation’s metropolitan areas have undergone massive growth (Choy & Buxton 2013). As a result large areas of Australia’s best agricultural land in the peri-urban region are being rezoned for residential development creating more of the same food desert, car-centric communities, where each individual residential development has a disproportionate building-to-plot ratio. The end product leaves no room for food growing and the only way to acquire food is to drive to the nearest supermarket and purchase energy-intensive produce with a huge “food mileage” (Gaynor 2006; Head & Muir 2007; Hall 2010).

Our food is largely produced using intensive agricultural inputs, processed beyond recognition and transported by trucks, ships and planes from far-flung corners of the world (Johnson 2010, pp. 4-5). For example, garlic from China would have travelled 9,572 km to Australia while citruses traverse 12,056 km across the Pacific from California (Blue Mountains City Council & Sydney West Area Health Service n.d., p. 6), providing Australian consumers with cheap, all year supply. All these activities are
highly oil-dependent and any fluctuation to oil supply and pricing can have a huge impact on the price of food and its availability (Cribb 2010).

Another layer to this already complex issue is the concentration of power and consolidation of control of our food supply by a handful of large and influential multinational businesses (Lang, Barling & Caraher 2009; Patel 2009). For instance, 10 agri-chemical companies control 84 per cent of the world pesticide market while the global food processing market is under the control of 10 companies, and globally 10 retailers have 24 per cent of the market share (Chopra 2009).

In Australia such market control is even more consolidated. Our food supply is monopolised by two major supermarket chains. These dictate what is available on the local supermarket shelves and how much farmers and producers will be paid for the produce.

Already, half of the world’s population lives in urban areas and according to the United Nations by the year 2050 urban dwellers will account for 86 per cent of the population. With an ever-increasing urban population, one of the many challenges will be access to food by urban dwellers in all major cities around the world:

More and more urban populations are experiencing hunger and often with more intensity than those in rural areas. New data presented by UN-HABITAT on malnutrition in urban areas - as measured by the incidence of underweight children - shows significant differences in food security access across socioeconomic groups in cities. As the relentless rise in food prices in urban areas combines with persistently low incomes, the urban poor cannot afford to purchase adequate amounts and types of food. Paradoxically, even in those countries with enough food for the whole population, only the richest can access it, while the poorest struggle every day to ensure one meal for their offspring (United Nations Human Settlements Programme (UN-HABITAT) 2008, p. xiv)

Given the above-mentioned issues, how will Melbourne handle the challenging situations of feeding its growing population? The Department of Planning and Community Development (DPCD) (2012, p. 3) predicts that Melbourne’s population will reach 6.5 million by 2051. In the same report the department also forecasts the
Projected growth areas for Melbourne are Cardinia, Casey, Hume, Melton, Mitchell, Whittlesea and Wyndham. It is worth noting that the southern part of Mitchell Shire recently has been included within Melbourne’s Urban Growth Boundary and is now considered to be part of metropolitan Melbourne for planning purposes (Department of Planning and Community Development 2012, pp. 3-6).

![Figure 1: Melbourne Urban Growth Boundary (Growth Areas Authority Victoria 2012)](image)

It is equally important to acknowledge that some of the most productive agricultural land lies on the city fringe within the identified growth areas. A report by the Food Alliance and the Victorian Chapter of the National Heart Foundation of Australia (2012, p. 14) reveals that more than 50 per cent of Victoria’s vegetables are grown within 100 km of Melbourne.

In the 1950s, Melbourne had over 2000 km² of agricultural land within the urban boundary, and approximately 90 km² of land for fruit and vegetable growing. By 2030, it is estimated that none of the original fruit and vegetable-growing areas will be left, and there will be less than 200 km² of agricultural land (Food Alliance and National Heart Foundation of Australia (Victorian Division) 2012, p. 14).
1.3 Research questions

The trigger for this research is Australian household food security within an urban context. As illustrated, the issues are multilayered and compounded by peak oil and climate change. How can urban backyard food production help address urban household food security?

This thesis investigates the potential and capacity of urban backyard food production, and its role in addressing food security. Chapter 2 reveals that there is a dearth of academic literature on urban backyard food production, not just in Australia but worldwide. There is also a lack of quantitative data on urban food production that could provide useful information on the production capacity and potential.

1.4 Methodology

This thesis uses both quantitative and qualitative approaches. Quantitative data provide empirical evidence of how much food is actually produced from the sampled backyards, and also the variety of produce generated. As the study reveals, the average urban backyard is capable of producing more than just fruits and vegetables. Eggs, honey and meat are also produced by urban dwellers as demonstrated in Chapter 5.

The qualitative approach examines reasons and motivations for participants to engage in growing food in their backyards. It enables thematic analysis and cultural meaning by examining the demography and food growing practices of the participants, and also by looking at how participants deal with excess and surplus from their harvest.

1.5 Thesis structure

The thesis is divided into six chapters. Chapter One has set the scene by contextualising the issues around food consumption and production. In the following chapter, the review illustrates current ideas on urban food production and the evident gaps in the studies. Chapter Three outlines a brief historical context about food production in Australia and in detail, the scope of the research. In Chapter Four, the research design and methodology for both the quantitative and qualitative aspects are investigated and justified. The research findings, actual production capacity, recurring themes, emerging trends and patterns are presented in Chapter Five while Chapter Six concludes the thesis with discussion into the potential of urban backyard food production in addressing food security.
security in Melbourne, including challenges and future directions.
Chapter 2. Unpacking The Current Global Food System

2.1 Introduction

There are numerous books, journal articles and theses on issues related to urban agriculture, urban food production and food in general. This literature review will look at health and nutrition and access to fresh food by people in urban areas, often referred to as food security.

VicHealth describes food security “as the ability to consume quality, affordable, culturally appropriate nutritious food from non-emergency sources” (Pryor 2008, p. 1), while Budge and Slade (2009, p. 12) define it from the perspective of the producers, “reliable long-term markets, sustainable practices and an equitable return.”

A related problem, explored in this chapter, is urban population and the growth of urban sprawl, which in turn has given rise to the debate on land usage and urban food production, specifically in relation to peri-urban agriculture (Cook & Harder 2013). Another area of study that will be examined is the emergence of an alternative food system (also referred to as a local food system) and its myriad of forms: from local food swaps to community supported agriculture, better known globally for its acronym of CSA. All these issues broadly represent the over-arching symptom of a food system in crisis in most cities around the world. Finally, this chapter assesses the research shortcomings from the literature review on urban food production.

2.2 Health, nutrition and food security in the city

Access to fresh and diverse food is crucial for maintaining good health regardless of one’s locality (Neff et al. 2009; Demaio 2013). A poor and unhealthy diet runs the risk of triggering many chronic diseases such as diabetes and cardiovascular related complications. Poor diet is also a contributing factor to the growing epidemic of obesity (Crawford 2013) and diabetes, especially among young children and teenagers.

In the State of Victoria alone, less than half of the adult population eat the recommended number of serves of fruit per day in addition to the less than 10 per cent who consume the daily recommended servings of vegetables (Food Alliance and National Heart Foundation of Australia (Victorian Division) 2012). Further, the report also points out
that one in 20 people in Victoria are food insecure due to a lack of financial means to buy food.

Studies have also shown that there is a strong correlation between access to a car and access to food. In the case of Melbourne the lack of a car can reduce food access and options (Dixon et al. 2007; Donovan, Larsen & McWhinnie 2011; Food Alliance and National Heart Foundation of Australia (Victorian Division) 2012).

It has been documented that one of the contributing factors in the decline of urban health and changing social condition among those from the lower socio-economic groups in urban areas is the change in food availability (Eisenhauer 2001; Ruel, Garrett & Haddad 2008).

The globalisation of agriculture has contributed to the escalating changes in social condition, particularly food availability. These changes are due to many factors but the three main ones are inadequate food planning (Budge & Slade 2009; Donovan, Larsen & McWhinnie 2011), the consolidation of the food related sector (Lang, Barling & Caraher 2009) and lack of access to transportation (Coyle & Flowerdew 2011; Haletky & Taylor 2012).

In all three situations described above, options become limited and food availability comes in the form of over-dependency on fast food, take away food and convenience stores, which carry mainly processed food with limited variety and overpriced perishables.

### 2.3 Food growing vs. city expansion

Many scholars have investigated the dynamic relationship between food and the city and how the former has helped shaped the evolution of the latter. Historically, cities were small settlements that grew and expanded in many instances into mega-cities. Food and the natural environment that produced it helped shape and define the development of townships and settlements and even determined their locations.

In her book *Hungry City*, Steel (2009) studies the metamorphosis of cities, from Roman times to modern day London and New York, and the impact food has in shaping the lives
of city dwellers, and how once food-related activities were an integral aspect of life in the city. What she highlights is that at one point in time, food was produced closer to where it would ultimately be consumed. But all that changed in the nineteenth century with the expansion of the railway networks, which eventually led to the growth of suburbs as more people migrated to the cities.

That trend continues. As cities expand to accommodate new arrivals, fertile food-producing land within the immediate surroundings, often technically referred to as peri-urban areas, vanishes to make way for urban growth (Cook & Harder 2013; Paül & McKenzie 2013). One of the major social impacts of urban growth is the creation of a divided city between those living in the inner suburbs with all the amenities and convenience (for example access to public transport network and the availability of fresh food), and those living at the car-centric city’s fringe — i.e. new sub-division housing developments — with limited public transport services (Pothukuchi & Kaufman 1999).

According to researchers at the University of Melbourne, in the 19th century small farming once flourished in the Melbourne suburb now known as Coburg. Forty per cent of the area was once under crops, mainly hay for the Melbourne horse market, in addition to a scattering of orchards, vineyards and thriving market gardens by the Merri Creek. The area was also a granary, producing over a quarter of the city’s grains and potatoes (School of Historical Studies, Department of History 2011).

Some of the most fertile agricultural land in the State of Victoria is located within the peripheral areas of the city itself. Acreages of this best agricultural land are being rezoned for residential development to accommodate urban growth (Budge & Slade 2009; Donovan, Larsen & McWhinnie 2011).

The peri-urban region of Victoria is the food bowl of the State with over half of its vegetables and around 17 per cent of its fruits being produced on prime agricultural land within the urban growth boundary (Carey & McConell 2011, p. 11). The threat to peri-urban farmland merited a special report in *The Age* newspaper where the journalists observed that ongoing sprawl is threatening 70 per cent of Victoria’s fresh vegetable and fruit production (Millar & Fyfe 2012).
The dynamic between the need to house and feed a growing population is complex and one of the many challenges faced is food security. When people have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences, they are food secure (Food and Agriculture Organisation 2003).

In the case of Melbourne, less fertile land for cultivation means the same food previously produced in the surrounding areas would have to be brought in from further afield. Any additional costs in the food supply-chain system are factored in and priced accordingly and consumers end up paying for the extras in the form of higher food prices (Donovan, Larsen & McWhinnie 2011; Demaio 2013).

The most vulnerable are the elderly who are dependent on public transport and those from lower socio-economic groups living in new sub-divisions (ironically these sub-divisions were once fertile and productive food growing land) where there is an excess of fast food outlets, service stations and expensive convenience stores selling mainly highly processed food.

Budge and Slade (2009) observe that the lack of access to healthy fresh food does impact people’s choice and affordability, which is further linked to health issues like juvenile obesity and chronic diseases such as diabetes.

2.4 The emergence of an alternative food system and the birth of a local food movement

The problematic issues of the current food system thus far explored have led to the emergence of a food-focused social movement. Relatively small in scale in comparison to the global industrialised food system, the rise of the alternative food system signifies “a momentous shift in thinking on a broad scale about the implications of the food we eat every day” (Clapp 2012, p. 7)

Although the movement manifests in various shapes, forms and scales, for the purpose of this review, it is regarded as a single movement with one unifying goal, which is to offer an alternative option to the current industrialised food system with a centralised supply-chain network.
The current food system is a complex multilayered matrix, one which intersects politics, human rights, social justice, resource management, resource depletion and environmental management. It is a wicked problem with no easy, one-size-fits-all solution (Rittel & Webber 1973).

Lord Cameron of Millington, former head of the United Kingdom Countryside Agency once declared that the nation was “nine meals from anarchy” (Boycott 2008, Simms 2008, Cockrall-King 2011). He was referring to a global food chain in crisis and the vulnerability of the system to external threats such as a natural disaster or the volatility of oil prices, inferring that local supermarkets have a carrying capacity of three days worth of essential supply.

As Simms (2008) points out, the highly globalised and industrialised economy, with its over-dependency on oil and heavily centralised distribution systems, created the current food arrangement organised along just-in-time delivery principles, making the system
highly vulnerable. In her article, Boycott (2008) cites the chaos following the aftermath of Hurricane Katrina where widespread looting took place as a means of survival.

To help address some of the issues within the contemporary food system, a number of alternative food movements have emerged in recent years (Scrinis 2007). These started locally and tend to be small in scale, although some have grown beyond their starting point with cohesive international presence, like the Slow Food Movement (Petrini 2007). Some of the emerging initiatives are slowly getting the attention of researchers, for example local food swaps, which tend to be very informal and are often held at public spaces like a verge, reserve, school yard or neighborhood house, and the more radical actions such as gleaning, including freeganism.

Vogel (2005), citing Tilly, describes a social movement as a distinct political form. Social movements cross geographical boundaries providing a platform for political discontent in a unique way — a renaissance period for civil society on a global scale. In this thesis, the terms local food movements and alternative food movements are used interchangeably.

2.5 Food as a social movement

The alternative food movement is a worldwide phenomenon (Starr 2010; Kremer 2011). It has several tentacles with many far-reaching initiatives, from the all-encompassing community garden of Todmorden in the UK (Graff 2011) to the regeneration and greening of the Dead Sea Valley in Jordan (Mackintosh 2011). Some of the initiatives are food growing or production-specific, as in the case of community gardens, while others are consumer driven such as the local food movements. Others are a direct collaboration between producers and consumers as in the case of community-supported agriculture (CSA).

Gail Feenstra (2002, p 100) defines a local food movement as “a collaborative effort to build more locally based, self-reliant food economies — one in which sustainable food production, processing, distribution and consumption are integrated to enhance the economic, environmental and local health of a particular place.” Her description captures the very nexus of all the ideas and issues related to food and is inclusive of the social, environmental, health and wellbeing and economy of the community.
Urban gleaning and recovery are means of acquiring food outside of the mainstream food system and neither involves money. Gleaning in the urban context is not exclusively limited to food, but a major component of this activity is about securing food from unconventional places and spaces. The term gleaning includes a variety of activities: ‘dumpster diving,’ urban scavenging,’ urban foraging,’ ‘skip-dipping,’ ‘bin scaben,’ ‘thrashing,’ ‘dumping,’ ‘binning,’ and ‘scabbing’ (Sustainable Consumption: Urban Gleaning 2006; Edwards & Mercer 2007).

Gleaning usually involves ‘rescuing’ food that otherwise would go to landfill. This involves scavenging for fresh, packaged and expired food from supermarkets’ and stores’ bins, and other publicly located skips and bins (Sustainable Consumption: Urban Gleaning 2006). In addition, gleaning also includes the procurement of fresh perishable food grown on both public and private lands (Vedelago 2012).

Food recovery refers to the collection of wholesome food for distribution to the needy in the local community, and this could be surplus from packaging, or distribution, or retail outlets, and in some instances produce that is deemed too perishable to transport to retail outlets (Australian Organic Food Directory 2013).

Both gleaning and food recovery are not involved in the actual production of food and may not directly contribute to food security in the long term. However, their role in the alternative food system is to stop wastage by salvaging what is edible and redistributing it.

On the other hand community gardens (also referred to as allotment gardens in the UK) are involved in direct food production at a local level. They are generally small plots within a larger parcel of land usually owned by local government or private organisations, and rented out separately to individuals or a group of people (Pinkerton & Hopkins 2009).

They are experiencing a global revival, especially in large cities in North America and Europe where there has been a long tradition of food growing. Historically, the upheaval caused by WWII, in countries like the UK, US and Canada meant that they had to grow food on vacant land. This in turn saw the origin of the Dig for Victory and Victory Garden
campaigns in the UK and US/Canada respectively (Johnson 2010). According to Pinkerton and Hopkins (2009, p. 56), it is estimated that there are “approximately 300,000 allotments in use in the UK, covering 12,150 hectares and with the capacity of producing approximately 250,000 tonnes of fresh food each year.”

From Los Angeles to Toronto, community gardens are sprouting prolifically. According to Cockrall-King (2012) the City of Vancouver lists 55 registered community gardens with 2,200 plots available for its city dwellers. According to Green Net, a Chicago-based NGO, the city boasts more than 600 community gardens (Taylor & Lovell 2012). Detroit is currently home to more than 1,200 community gardens. That is more than nine per square mile, followed by Cleveland and New York City at four per square mile (Gabriel 2012).

There are more than 500 community gardens in New York City alone and 80 percent of these are used for food production (Gittleman, Jordan & Brelsford 2012). Locally, exact numbers are hard to come by. A search in Melbourne yielded a result of about 50 based on a newspaper article in The Age newspaper (Tomazin 2003).

According to Gittleman et al (2012), community gardens also promise to deliver more than just food security as they are also the focal point for other socially beneficial community engagement by offering intergenerational, intercultural activities. Another local occurrence in community gardens is the food swapping experience or surplus, although items swapped will often include seeds, seedlings and horticultural tips and knowledge.

Community gardens are not problem free and one of the main contentious issues is tenure since the land is either government or private owned. Another issue is the legality of selling surplus harvest which varies from place to place (Pinkerton & Hopkins 2009). These issues may render community gardens as not a stable nor commercially viable source of food production.

On the consumer side of the alternative food scene are: the CSA initiative, the slow food movement and the locavore movement.
“Local eaters’ and “local food advocates” are the terms coined by Steven M Schnell (2013, p.2) to describe “those who make a conscious effort to eat more food from nearby sources.” However, the very definition of ‘local’ in the food context is ambiguous, debatable and even contentious. Nevertheless, the United States Department of Agriculture (USDA) defines ‘local’ as being “less than 400 miles from its origin, or within the State in which it is produced” (Martinez et al. 2010, p. iii).

The USDA report also cites several characteristics that consumers attribute to ‘local food’ ranging from farming practices to fair farm labour practices and animal welfare, all making the debate around local food complex and tenuous. Contentious as it may be, the report acknowledges the growth of the sector and its significant contribution to the local economy.

In 2007, the New Oxford American Dictionary announced that the “Word of the Year” was ‘locavore,’ a term coined in 2005 by a group from the Bay area in San Francisco to describe the act of eating food grown and produced within a 100-mile radius of where one lives (Oxford Word of The Year: Locavore 2007). The concept of locavore entered mainstream vernacular when Barbara Kingsolver documented her family's experiment of eating food grown and raised on their small farm in southwest Virginia (Kingsolver, Hopp & Kingsolver 2007).

CSA is short for community supported agriculture. Schnell (2013, p. 6) describes it as “a form of agriculture where members join a farm for a season, paying up front for the food and then receiving a share of the harvest each week.” Due to the nature of its arrangement, CSA tends to involve small-holding farmers located just outside the city.

All of the initiatives described above are not without their critics and sceptics. One critical aspect of the local food movement is that it takes into account the distances the food has travelled but it does not consider the total energy used in actual production of the produce (Saunders, Barber & Taylor 2006). The movement is also criticised for being exclusionary, characterised by élitism, reactionary politics and xenophobia (Schnell 2013).
2.6 Gaps in the studies

Current local food research is characterised by the nutritional vs food security debate, with limited materials on informal household food production (Martinez et al. 2010; Ghosh 2012).

As Kortright and Wakefield (2011, pp. 39-40) observe, although many people are engaged in food production in the city it is also harder to quantify their efforts “since household food gardening takes place on private land.”

Gray et al (2013, p. 2) also observe, “research on home gardens, particularly in the developed world, is sparse, mostly like due to the informal nature of home gardens as well as their closed and private nature.”

Taylor and Taylor (2012), quoting Gray, observe that the actual and potential impacts of home gardens on both household and community food security in the United States and the Global North are under-researched.

In the literature reviewed here, the quantitative data (both in weight and complete list of type of produce) on food production by individuals household on private land are almost non-existent. However, there is an ongoing attempt to quantify produce in community gardens in New York (Gittleman, Jordan & Brelsford 2012). In their three-year project, the authors are using citizen science to quantify community garden crop yields within the city.

This thesis identifies gaps in the quantifiable study of urban backyard food production and highlights its potential capacity in contributing to the ongoing debate on an alternative food system, or local food system.
Chapter 3. Research Design and Methodology

3.1 Introduction

This research is primarily based on the science of social-cultural reasoning. It involves the study of human social-cultural life such as behaviours, interactions and relationships, often referred to as social sciences or “soft sciences” (Neuman 2011). As such, this research is grounded in theory and data. It is a preliminary investigation into the concept of backyard food production in the broader context of urban food security.

The intent of the research is to determine the food production capacity from private urban backyards within the Melbourne metropolitan area, and also to discover the motivation and impetus for producing such food.

The strategy of using mixed methods is to combine both quantitative (numerical weight of produce) and qualitative data (description and experiences — the reasons and rationale for growing food in one’s backyard) into a comprehensive report. In this instance, surveyed questionnaire responses are used to determine the relationship between food growing habits and practices (e.g. conventional, permaculture technique, biodynamic, etc.) and yield capacity.

By collecting and comparing the quantitative and qualitative data, the outcomes of the study will offer a more comprehensive perspective to the research question, which is how much food is being produced from urban backyards in Melbourne, and how is the food being produced. This covers a range of production methods including aquaponics (the integration of aquaculture and hydroponic for food production) and entomophagy (the practice of insect rearing and eating).

The methodology acknowledges the data gaps in the field of urban backyard food production and recognises that a more in-depth and comprehensive study is necessary to produce more robust, empirical evidence-based findings.

3.2 Mixed methods approach

Briefly, mixed methods research is designed with philosophical assumptions as well as methods of enquiry and it also contains elements of both quantitative and qualitative purpose statements. Elaborating, Creswell and Clark (2007) point out that this type of
research focuses on collecting, analysing, and mixing both quantitative and qualitative data in a single study or series of studies. The core premise of this theory is that by combining both quantitative and qualitative approaches, the findings will produce a more comprehensive understanding of the issues and problems.

A more precise definition of this style of enquiry is provided by Creswell et al (2003, p. 212) who explain “a mixed methods study involves the collection or analysis of both quantitative and/or qualitative data in a single study in which the data are collected concurrently or sequentially, are given a priority, and involve the integration of the data at one or more stages in the process of research.”

Describing the method as pieces in a jigsaw puzzle, Erzberger and Kelle (2003, p. 461) explain, “the use of different methods to investigate a certain domain of social reality can be compared with the examination of a physical object from two different viewpoints or angles. Both viewpoints provide different pictures of this object that might not be useful to validate each other but that might yield a fuller and more complete picture of the phenomenon concerned if brought together.”

This approach to research is not without its critics and concerns. Traditionally, quantitative methods have always been associated with positivism while qualitative research methods were regarded as constructivism. Bergman (2008, p. 12) raises several concerns and apparent contradictions by questioning: i) whether different types of data or different findings should be mixed, and ii) the possibility of mixing different theoretical approaches or even the possibility of mixing epistemologies? Bergman eventually concludes with other writers and scholars that mixed methods are in line with contemporary practices as they open “the research process to a wealth of many new possibilities in relation to data collection and data analysis techniques.”

Triangulation is another aspect of research design that sits within the mixed methods approach. In social science, triangulation is simply the process of observing from several vantage points (Neuman 2011) based on the principle that more can be learned by making observation from multiple perspectives rather than a single perspective. With this in mind, this research study has also incorporated triangulation in its design.
3.3 Design of the research

The research design is divided into two parts. The first part is about food production capacity and the method used to ascertain numerical data is sampling. The main objective is to determine how much food is produced from the sampled backyards. The emphasis is not on the number of people growing food in their backyard. In this instance, the measuring implement used is a set of kitchen scales whereby the harvest is meticulously weighed and logged in a spreadsheet.

The second part of the research is more subjective in nature as it involves participants responding to a set of questions about food growing habits and preferred food cultivation practices. This approach is critical to understanding the motivation for engaging in food growing, both from a heuristic inquiry perspective and for theme identification. This method of inquiry also allows for the mapping of emerging patterns and trends.

The numerical data gathered in the first part of the study are analysed in combination with the qualitative data from the second part to paint a clearer picture of backyard food production. The primary source that forms the very premise of this research is the quantitative data, which is greatly enhanced by the secondary qualitative responses by participants to a set of questions.

The quantitative measurement process used in this research is straightforward. It involves measuring (or more precisely in this instance the weighing of harvested produce), and collating of other data (noting types of produce being harvested and weighed) by the participants themselves for a set period of time, to produce precise numerical information. Numerical data are considered a uniform, standardised and compact way to empirically represent abstract ideas (Neuman 2011).

In contrast, the qualitative aspect of this research study provides a diverse and variant of nonstandard data ranging from personal experience to community interaction and connectedness. Within the framework of this study, the qualitative findings serve as the secondary sets of data which, in combination with the primary, offer a clearer understanding of the research questions.
As mentioned earlier, this study is an exploratory investigation into urban food production and as such the sampling strategy used is the nonprobability sampling technique, namely modified snowball sampling, that allows for nonrandom selection of participants who fulfilled a basic requirement. All participants are subject to both quantitative and qualitative data collection.

A targeted demography was initially identified and contacted, in this case five nonrandom groups. Based on the information gathered from that first initial contact, a new level, or layer of connections, is made and the process then repeats itself again and again until it reaches a saturation point where no more new interest in the research study is generated.

The participants are then selected based on their current ongoing involvement in food growing or food production based on the fact that they are convenient, easily available and readily accessible. Given the circumstances, this study cannot be considered a definitive sample nor representational of the general population. The sole intent is to determine the urban backyard food production capacity, i.e. crop yield. The proportion of the population engaged in food production is not central to this research study.

The two sets of data are separately analysed while the interpretations of the findings are integrated at the reporting stage. This allows for the securing of a much more detailed and contextualised information about the numerical data. As Neuman (2011) points out, a study that combines and mixes both the quantitative and qualitative research approaches and data tends to be richer and more comprehensive.

In this instance, the aim of triangulation of the quantitative data and qualitative findings is to search for complementary knowledge and intelligence. The numerical information of the total net weight of urban backyard food production, in combination with qualitative nonstandard responses to reasons and motivations behind food growing, will make for a richer understanding of the issues. The amalgamation of both sets of data will also help to corroborate findings.

In this study, kitchen scales are used to test the theory of urban food production capacity which predicts that food production by private households will hold a positive influence on local food system.
Chapter 4. Background and Participants Profiles

4.1 Introduction

As noted, the very core of this research is food production (and there is more to production than just fruits and vegetables as discovered) on private land by individuals or individual households. Secondary to production are techniques and practices adopted by participants, and their reasons and motivations for engaging in food production at this very private and personal level. Food surplus is another aspect being looked at and how participants deal with excesses. Food waste, however, is beyond the scope of this research.

Even though the study is based on private land (as opposed to public land and shared open space), it is also important to clarify that landownership is irrelevant to this research. The logic is one does not need to own one’s place of dwelling in order to produce food from the immediate surrounding land, and as such it is not part of the argument here. However, the location of where the food is produced is relevant, both spatially and geographically, as explained further in this chapter.

The participants in this research are precisely selected for: i) their location, and ii) their food production activities. It is important that they are located within roughly a 70-kilometer radius of the city and it is equally crucial that they are already engaged in food production for all practical purposes, especially from an ethical perspective. The study has been categorised as a low risk research project by the RMIT University ethics review committee.

Several different approaches were used for the recruitment process. The first was an appeal through personal friends, family members, peers and colleagues. The next approach was to leverage on social media platforms, namely personal blog, Facebook, LinkedIn and Google Plus. These initial initiatives created a ‘chain of referral’ (Neuman 2011, p. 269) to other groups such as the Moreland Energy Foundation Limited (MEFL), Moreland Food Gardens Network (MFGN), Permablitz, Transition Town Coburg, Transition Town Darebin, and Swap Shuffle and Share (SSS).

These key local actors and agencies helped to spread the word through their newsletters and local meetings. All participants were recruited either through referrals from these
local networks or through word of mouth via personal networks and other influences. The idea of quantifying urban backyard food production generated a lot of interest and the original number of participants was slightly higher but eventually not everyone was able to sustain the required data collection period.

Figure 2 is a visual representation of the multi-layered network of connections and relationships developed through the snowball sampling technique utilised to access 15 urban backyard food producers. Social media and personal referrals proved to be the most effective in the recruitment drive, followed by local non-for-profit agencies like MEFL and MFGN.

Only those who are currently active in actual urban backyard food production are selected for the study. Having the gardening knowledge and other horticultural skills are considered vital because the nexus of all this know-how is the food production.

Data were collected directly by the participants themselves by logging in their harvest into a pre-prepared spreadsheet (see Appendix 2) for a continual period of 12 weeks, and by using a semi-structured survey question (see Appendix 3) which they filled in themselves. The entire collection period ran from July 2012 to July 2013 — representing a full planting calendar. It is considered important to have production data for a full year as yields and diversity of produce vary from season to season.

Both sets of data were then analysed separately and coded for emerging patterns and trends.
4.2 The importance of the backyard

It is crucial to understand the historical evolution of backyards, particularly in the context of urban consolidation and population growth. Australian backyards have evolved since the time of first European settlement. What once was a place of production is now largely one of consumption (Gaynor 2006; Head & Muir 2007; Hall 2010).

The colony's first governor Arthur Phillip, in 1789 regulated a single dwelling on the average block size in the suburbs at 18.3 m x 45.7 m, roughly just under a quarter of an acre (Hall 2010; Head & Muir 2007).
Phillip's plan was out of hand within a few years. However, it has laid the seeds for what would become the norm in the 20th century subdivision: an emphasis on a spread of homes and gardens rather than a dense network of terraces — characteristically suburban forms as distinguished from the urban forms of the industrial city (Hall 2010, p. 5).

Ever since, the proverbial “quarter acre block” has been the status quo and dominant form of development throughout Australian suburbs (Halkett 1976). Citing Timms, Hall observes that in the first half of the 19th century, small houses on large blocks of land was the emerging trend across Australian cities. The phenomenon was most notable in Melbourne due to an ample supply of cheap land and the discovery of gold, which led to two things: i) city sprawl, and ii.) Australian suburban houses being built on big backyards by world standards.

The backyard is part of the Australian suburban vernacular and for a time leading up to the Second World War, it had a more utilitarian aspect to it. One of the more common functions then was food production, including small-scale poultry farming (Gaynor 2012).

However, over time, notably after the war and leading up to the 1980s, the backyard has transitioned into more of a socialising space. It has ceased to be a ‘production’ and morphed into a ‘consumption’ space (Gaynor 2006; Head & Muir 2007; Hall 2010).

The change is also a reflection of Australia’s social, economic and technological transition and “the use of the backyard for growing vegetables or as a place for messy hobbies receded.” (Timms, cited in Hall 2010, p 6).

In her seminal work, “Harvest of the Suburbs — An Environmental History of Growing Food in Australian Cities,” Gaynor (2006) documents the enduring popularity of food production in the Australian suburbs, while unpacking the complex dynamic between food production and various other debates around it such as health, community and nature.
Challenging some of earlier studies, Gaynor points out that a substantial proportion of Australian backyards are still being used to grow and produce some food for the households. She also discovers in the 20th century, contrary to conventional wisdom, those engaged in home food production come largely from a middle class background, and skilled workers with steady employment:

For these people, home production has long been a source of food valued for its freshness, purity and health-giving qualities. Perhaps it is not so easy, then to neatly assign fowl coops, fruit tress and veggie patches to the category of working-class and rural functionality (Gaynor 2006, p. 3).

It is also important to recognise the importance of backyards in a wider social, cultural and environmental contexts. For example, as Head and Muir (2007) explain, backyard activities, such as watering, have direct links to catchment areas located further afield, and to ground waters and aquifers immediately below. The authors also observe that backyards are often a space for socialising and, in the case of migrants, it is also a place where cultural connections are maintained through the cultivation of fruit and vegetables pertinent to their culinary heritage.

4.3 Scope of the research

This section will outline the scope and extent of the research. The study area is set at 70-kilometer radius from the CBD, with a small of allowance of 10 kilometers beyond the set limit.

The term “backyard,” for the purpose of this research, includes all the areas on the sides of the dwelling, the areas at the back of the house as well as the front areas, and in some instances the nature strip immediately belonging to the sampled household and is cultivated with edibles, including roof areas, balconies and verandas. It is a well-defined private space, or space directly controlled by the sampled household where food is produced or grown, as opposed to public open spaces. ‘Private’ in this instance includes both ownership and renters. As such this research excludes community gardens, private allotments, school kitchen gardens, restaurant gardens, market gardens and any other commercialised gardens, even if privately owned and managed.
The research focuses mainly on production capacity, variety of produce, methods of production (including sustainable practices such as composting, rainwater collection and horticultural practices or principles such as wicking beds and biodynamic respectively), treatment of surpluses and motivations for engaging in food production. It is beyond the scope of this research to examine the material inputs (such as fertiliser, herbicides and pesticides) or time inputs associated with food production, nor is it exploring the energy consumption (including embodied energy). The study does not explore the financial savings to participants in growing some of their food.

Nor will this research be making yield comparisons based on the horticultural skills of the participants, or the production capacity of the studied backyards. The emerging trends and patterns from data analysis may infer a propensity for a certain food production technique or practice, which could result in a higher yield being produced. However, this study is not designed to empirically or scientifically substantiate the relationship between a preferred production technique and yield.

The focus of the research is the social psychology of food production and consumption. This is represented by the orange circle in Figure 2.

### 4.4 Profile of participants

The participants are dispersed within the set 70-kilometer limit, with a high concentration in the northern part of the city, namely within the Moreland City Council. This is perhaps due to the strong presence of key actors (e.g. MEFL, MFGN and Transition Town Coburg) in the snowballing recruitment process as illustrated in Figure 3. This is followed by suburbs in the south west of the CBD, with one participant located in the Southeast. Figure 4 pinpoints the location of the sampled backyards.
All of the participants live in a detached house on a generous block of land. With the exception of three households, all are home owners and all are engaged in some kind of profession with one retiree, one home maker and one volunteer worker. All participants are from middle-class backgrounds, mostly professionals, confirming the findings of Gaynor (2006). They range in age from early 30s to late 60s. The gender ratio of participants is 3.75 female to 1 male. Table 1 presents a summary of the participants.
<table>
<thead>
<tr>
<th>Suburb</th>
<th>Gender</th>
<th>Type of dwelling</th>
<th>Tenure</th>
<th>Profession</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Coburg</td>
<td>F</td>
<td>Detached house</td>
<td></td>
<td>Home owner</td>
</tr>
<tr>
<td>2 Preston</td>
<td>M</td>
<td>Detached house</td>
<td></td>
<td>Home owner</td>
</tr>
<tr>
<td>3 Coburg North</td>
<td>F</td>
<td>Detached house</td>
<td>Renting</td>
<td>Retiring</td>
</tr>
<tr>
<td>4 Coburg North</td>
<td>F</td>
<td>Detached house</td>
<td>Renting</td>
<td>Home owner</td>
</tr>
<tr>
<td>5 Ascot Vale</td>
<td>F</td>
<td>Detached house</td>
<td>Renting</td>
<td>Home owner</td>
</tr>
<tr>
<td>6 Coburg</td>
<td>F</td>
<td>Detached house</td>
<td>Renting</td>
<td>Home owner</td>
</tr>
<tr>
<td>7 Werribee</td>
<td>F</td>
<td>Detached house</td>
<td>Renting</td>
<td>Home owner</td>
</tr>
<tr>
<td>8 Coburg North</td>
<td>F</td>
<td>Detached house</td>
<td>Renting</td>
<td>Home owner</td>
</tr>
<tr>
<td>9 Werribee</td>
<td>F</td>
<td>Detached house</td>
<td>Renting</td>
<td>Home owner</td>
</tr>
<tr>
<td>10 Thornbury</td>
<td>M</td>
<td>Detached house</td>
<td></td>
<td>Home owner</td>
</tr>
<tr>
<td>11 Coburg North</td>
<td>F</td>
<td>Detached house</td>
<td></td>
<td>Home owner</td>
</tr>
<tr>
<td>12 East Bentleigh</td>
<td>M</td>
<td>Detached house</td>
<td></td>
<td>Home owner</td>
</tr>
<tr>
<td>13 Hoppers Crossing</td>
<td>M</td>
<td>Detached house</td>
<td></td>
<td>Home owner</td>
</tr>
<tr>
<td>14 Clifton Hill</td>
<td>F</td>
<td>Detached house</td>
<td></td>
<td>Home owner</td>
</tr>
<tr>
<td>15 Pascoe Vale South</td>
<td>F</td>
<td>Detached house</td>
<td></td>
<td>Home owner</td>
</tr>
</tbody>
</table>

Table 1: Profile of participants.
Figure 5: Photos of sampled backyards, from left to right in clockwise direction: rows of potato plants in no-dig garden beds, an urban food forest, vertical bed of edible green, and an apple tree with a rain water tank in the background, free ranging urban backyard chickens and rows of corn in a raised bed. All photos by the author.
Chapter 5. Research Findings

5.1 Introduction

The initial number of participants was 20 with a 25-per cent attrition rate. Three participants withdrew for various personal reasons, one returned corrupted data and one did not return any data for final analysis. In total, 15 sets of data were tabulated and analysed. Of the 15 households, 20 per cent are renters while the remaining 80 per cent are homeowners.

The size of cultivated plot ranges from a modest 7 sq.m to a relatively large 250 sq. m. The highest yield of 50.227 kg is produced from a cultivated plot measuring 80 sq.m. and data collection is between the end of July 2012 to mid-October 2012. It also interesting to note that the some of the individual collection periods are in between seasons — for example from the end of autumn to mid-spring. Meanwhile the largest plot of 250 sq.m. produces 5.420 kg worth of food, and the collection period is from the middle of December 2012 to early March 2013.

The overall data collection period for the study ran from July 2012 to July 2013, with several overlapping collection periods. This has been deliberately designed to reflect inter-season production capacity. The idea is not to concentrate only on summer yield. The design of the data collection time span is more reflective of how urban food production is widely practised. During this 12-month period, each participant contributed 12 weeks worth of data, i.e. the total amount of food generated within 12 weeks. The collection periods lapse from early summer to early autumn, when Melbourne experienced a slightly hotter and drier season than average. The day time maximum temperature averaged 27.4°C. Meanwhile, the total rainfall for the same period was 108 mm, slightly less than the usual recorded 154.7 mm (Bureau of Meteorology 2013).

The total collective yield of all sampled backyards is 388.728 kg of nuts, fruits, vegetables, honey and meat, but not eggs. There is a notable difference in yield between each sampled backyard. However, the study reveals no direct correlation between plot size and yield, as demonstrated in Table 2. This is because the home garden is a combination of recreational space for entertainment and socialising as well as a space for food production. As a result, not every inch of space is dedicated to food production.
<table>
<thead>
<tr>
<th>No.</th>
<th>Start date</th>
<th>End date</th>
<th>Size of household</th>
<th>Plot size (sq. m.)</th>
<th>Total food growing experience (year)</th>
<th>Total yield (kg.)</th>
<th>No. of eggs (including quail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18 Jul 2012</td>
<td>10 Oct 2012</td>
<td>2.5</td>
<td>46</td>
<td>8</td>
<td>39.460</td>
<td>41</td>
</tr>
<tr>
<td>2</td>
<td>27 Jul 2012</td>
<td>19 Oct 2012</td>
<td>2</td>
<td>80</td>
<td>10</td>
<td>50.227</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>05 Aug 2012</td>
<td>27 Oct 2012</td>
<td>2</td>
<td>60</td>
<td>5</td>
<td>27.175</td>
<td>187</td>
</tr>
<tr>
<td>4</td>
<td>31 Aug 2012</td>
<td>24 Nov 2012</td>
<td>2.5</td>
<td>55</td>
<td>13</td>
<td>22.520</td>
<td>113</td>
</tr>
<tr>
<td>5</td>
<td>01 Sept 2012</td>
<td>23 Nov 2012</td>
<td>2</td>
<td>70</td>
<td>20</td>
<td>7.950</td>
<td>78</td>
</tr>
<tr>
<td>6</td>
<td>04 Sept 2012</td>
<td>26 Nov 2012</td>
<td>1</td>
<td>20</td>
<td>30</td>
<td>35.015</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>01 Oct 2012</td>
<td>31 Dec 2012</td>
<td>2</td>
<td>145</td>
<td>35</td>
<td>39.999</td>
<td>87</td>
</tr>
<tr>
<td>8</td>
<td>14 Oct 2012</td>
<td>08 Jan 2013</td>
<td>2</td>
<td>48</td>
<td>3</td>
<td>27.211</td>
<td>69</td>
</tr>
<tr>
<td>10</td>
<td>08 Nov 2012</td>
<td>31 Jan 2013</td>
<td>2</td>
<td>16</td>
<td>21</td>
<td>40.644</td>
<td>71</td>
</tr>
<tr>
<td>11</td>
<td>11 Nov 2012</td>
<td>04 Feb 2013</td>
<td>2</td>
<td>24</td>
<td>2.5</td>
<td>12.585</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>12 Nov 2012</td>
<td>03 Feb 2013</td>
<td>4</td>
<td>80</td>
<td>8</td>
<td>11.750</td>
<td>36</td>
</tr>
<tr>
<td>13</td>
<td>15 Dec 2012</td>
<td>08 Mar 2013</td>
<td>4</td>
<td>250</td>
<td>4</td>
<td>5.420</td>
<td>326</td>
</tr>
<tr>
<td>14</td>
<td>22 Dec 2012</td>
<td>15 Marc 2013</td>
<td>3</td>
<td>150</td>
<td>15</td>
<td>47.475</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>06 May 2013</td>
<td>29 Jul 2013</td>
<td>4</td>
<td>7</td>
<td>20</td>
<td>5.277</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2: Summary of urban backyard food production.
The plot size is a rough estimate of actual food growing area, since pots and other containers are not included in the calculation. It is difficult to calculate the size of pots and other similar containers. However, it is worth noting that the measured yield includes produce from pots and containers.

One notable feature is the diverse food growing technologies and practices employed by the participants. One exemplary backyard was established in 2008 using permaculture design principles. The owner has managed to create an urban food forest in the suburb of Preston. The concept of ‘forest garden’ was first made popular by American horticulturist Robert A de J Hart (1996). The Preston backyard boasts 16 different types of berries, more than 30 fruit trees in addition to over 70 varieties of medicinal plants and herbs. The total yield of this backyard over the 12-week period is 50.227 kg.

Table 2 illustrates the start and end of data collection period of every participant and the crop yields. The total includes meat, honey and honey by-products such as beeswax and honeycombs. In total, 101 different types of nuts, fruits, vegetables and other edible produce were generated by all participants collectively during the study period. Appendix 1 lists all the edible produce from the sampled backyards.

As illustrated in Table 2, the total plot size of the studied area was 1,096 sq. m., which produced 388.728 kg. worth of food (including quail meat, honey, honey by-products and mealworms), 1,015 eggs (of which 326 were quail eggs), which fed 39 people for 12 months.

All participants indicate a surplus of between 10 to 25 per cent, which is shared among other family members, friends and neighbors, or distributed through local swap and share networks. Of the 15 participants, only 33.3 per cent is engaged in food preservation, such as bottling, drying and freezing.

The study finds that backyard food production is capable of producing a great diversity of edibles from common kitchen garden herbs to less commonly cultivated fruits and vegetables, as well as less commercially available varieties like amaranth, apple cucumber, acorn squash, butter squash, babaco, cape gooseberry, edible canna, elderflower, gem squash, loganberry, nettle, oca, orache, purslane, rat-tailed radish, viola flower, warrigal green, white mulberry and yacon.
Some of the more commonly cultivated and commercially available varieties included asparagus, globe artichoke, broccoli, cauliflower, kale, Jerusalem artichoke, leek, lettuce, onion, potato, tomato, zucchini, a wide variety of common culinary herbs, a selection of fruits from stone fruits like nectarine, peach and plum to a variety of berries and citruses, plus apple, cherry and fig.

In addition, 60 per cent of participants also kept chickens, quail and mealworms. Chickens were kept exclusively for their eggs while quails were for both eggs and meat. Another source of protein which is less common is mealworms (Tenebrio molitor), the larvae of darkling beetle.

The type of produce is broadly segregated into 19 categories. The category “Beans” covers a wide variety; e.g. broad bean, French bean, string bean, etc. Blueberry, Cape gooseberry, loganberry, strawberry, raspberry, etc. are logged under “Berry.” Similarly “Citrus” includes grapefruit, lime, lemon, orange, etc.

Urban backyard food growers in Melbourne also produce a wide variety of fruits like apple, apricot, babaco, cherry, fig, nectarine and plum which are logged under “Fruit.” Kale, Mustard green, spinach, silverbeet, rainbow chard, Warrigal green as well as leafy Asian green such as bok choi and galena, are grouped together under “Leafy green.” “Herb” covers all manner of culinary herbs used in both western and oriental cooking.

Entomophagy, the practice of eating insects as a dietary supplement, is widely practised in parts of Asia and Africa, but it is not common in the Western world. The consumption of tenebrious molitor falls under this category.

Figure 7 illustrates the percentage of the 19 categories of grown produce. The chart does not include eggs, honey and honey by-products and quail meat. At 20 per cent, “other” is by far the largest segment in the pie chart (see Table 3: Yield percentage of sampled backyard over a 12-month period). This includes a wide variety of vegetables and other edibles such as almond, amaranth, asparagus, artichoke, celery, garlic, gem squash, Jerusalem artichoke, edible canna, nettle, onion, oca, olive, orache, parsnip, purslane, rat-tailed radish, yacon, water chestnut. This is followed by “fruit” at 15 per cent and “leafy green” at 12 per cent. “Citrus” which makes up 10 per cent of the total, includes a wide variety, such as grapefruit, lemon, lime and orange.
Figure 6: Yield percentage of urban backyard fruit and vegetable production.
<table>
<thead>
<tr>
<th>Variety</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Beans</td>
<td>10%</td>
</tr>
<tr>
<td>2. Berry</td>
<td>2%</td>
</tr>
<tr>
<td>3. Beetroot</td>
<td>1%</td>
</tr>
<tr>
<td>4. Broccoli</td>
<td>3%</td>
</tr>
<tr>
<td>5. Capsicum/chilli</td>
<td>1%</td>
</tr>
<tr>
<td>6. Cabbage/cauliflower</td>
<td>2%</td>
</tr>
<tr>
<td>7. Carrot</td>
<td>3%</td>
</tr>
<tr>
<td>8. Citrus</td>
<td>10%</td>
</tr>
<tr>
<td>9. Cucumber</td>
<td>2%</td>
</tr>
<tr>
<td>10. Fruit</td>
<td>15%</td>
</tr>
<tr>
<td>11. Herb</td>
<td>2%</td>
</tr>
<tr>
<td>12. Leafy green</td>
<td>12%</td>
</tr>
<tr>
<td>13. Leek</td>
<td>3%</td>
</tr>
<tr>
<td>14. Other</td>
<td>20%</td>
</tr>
<tr>
<td>15. Pea</td>
<td>2%</td>
</tr>
<tr>
<td>16. Potato</td>
<td>1%</td>
</tr>
<tr>
<td>17. Salad green</td>
<td>3%</td>
</tr>
<tr>
<td>18. Tomato</td>
<td>4%</td>
</tr>
<tr>
<td>19. Zucchini</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Table 3: Yield percentage of sampled backyards over a 12-month period.
All participants are engaged in both fruit and vegetable production but only 11 people (73.3 per cent) keep fowl (chicken and quail) for eggs. One participant also consumes quail meat and insects and raises fish for home consumption. However, fish were not harvested during the data collection period. One other participant keeps bees for honey, beeswax and honey comb, in addition to yabby and mushroom. Table 4 offers a summary of the varieties of food produced in the sampled backyards. A complete list of produce is itemised in Appendix 1.

### 5.2 Gardening practices, trends and patterns

All participants are involved in composting as one of their soil building strategies. Another is worm-farming, which is practised by 53.3 per cent of the participants. Eighty-six per cent of the participants are also into rain harvesting.
As for growing methods, 80 per cent indicate raised-bed as a preferred method, followed by pots and containers at 53.3 per cent. There is no clear-cut preference when it comes to food growing methods. The tendency is for more than one method. One participant follows the traditional method of gardening, i.e. digging and tilling the soil. Nine out of the eleven who practice permaculture design principles have incorporated raised-beds as part of their garden design. One has opted for purely pots and containers while one other, in addition to pots and containers, is also growing food vertically.

Other methods of food production include water garden, orchard culture, food forest (the combination of the three methods proves to be the most productive at 50,227 kg worth of food over a period of 12 weeks from a cultivated area of 80 sq. m.), wicking bed, aquaculture, hydroponic, entomophagy and roof top gardening. Table 5 summarises the types of gardens and gardening practices used by the participants.

All participants indicate that they are engaged in organic food production (i.e. without the use of artificial fertiliser, toxic pesticide and herbicide). Two practise companion planting as part of their pest management regime. Three participants follow the biodynamic principle in their food gardening practices. Composting of kitchen scraps and gardening waste is practised by all participants. However, only eight participants keep a worm-farm for the beneficial worm casting and worm juice.

From the sampled group, permaculture design is widely adopted and integrated in urban food production methodology. This involves an integrated approach to food production of no-dig, raised bed for food growing, the use of compost and/or worm-farm for soil improvement (and the use of animal manure for those involved involved in fowl and poultry raising), companion planting for organic pest management and rainwater harvesting for food production. Table 5 summarises types of garden and growing methods used.
<table>
<thead>
<tr>
<th>Permaculture</th>
<th>Raised bed</th>
<th>No-dig</th>
<th>Vertical</th>
<th>Pot/container</th>
<th>Organic</th>
<th>Biodynamic</th>
<th>Aquaponic</th>
<th>Hydroponic</th>
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Table 5: Type of garden, food-growing habits and practices.
5.3 Surplus and motivations

All participants register a surplus of between 5 per cent to 75 per cent, depending upon the crops and seasons. As noted earlier, surpluses are redistributed within the immediate family, and local communities through a variety of channels like local food swap as or the church. Food preservation is another way of managing surpluses.

The reasons and motivations given for engaging in backyard production can be divided into five broad categories: i.) health and nutrition including taste and freshness; ii.) ecology and environment, including issues like GE-free and organic; iii.) food security and self-reliance; iv.) cost; and v.) pleasure and enjoyment including lifestyle and spirituality. A full transcript of the responses is available in Appendix 4.

Of the five categories, the most mentioned is ‘environment and ecology’ at 80 per cent. This is followed by ‘food security’ and ‘self reliance’ at 73.3 per cent. Equally important to 73.3 per cent of the participants is the enjoyment and pleasure derived from food gardening. ‘Health and nutrition’ account for 66.6 per cent, while ‘cost’ accounts for only 40 per cent.

For those who highlight environmental and ecological reasons, some of the concerns mentioned are food miles, organic, GE-free, peak oil, climate change and stewardship. Those who cite lifestyle and pleasure as a motivation, also allude to a sense of achievement, connection to nature and spiritual fulfilment. In the survey response, participant No. 2 as featured in Table 1 notes:

Homegrown food is healthy, tastes better and has higher nutritional value than commercially grown produce. You can grow organic produce of your choice, including varieties that cannot be bought commercially. It’s very cheap to grow your own food, you know exactly what goes into the food because you grow it, and it’s part of a healthy lifestyle that reconnects people to nature, puts you back in touch with the cycles of nature throughout the seasons of the year, and provides a healthy pastime working with and nurturing living things, which has many flow-on benefits, physical, psychological and spiritual.
Taste and health benefits are often mentioned as reasons for growing food in the backyard, as noted by participant No. 4 from Table 1:

You appreciate food more when you know where it comes from and have seem the amazing process of it growing. Home grown has the best flavor and freshness and I prefer to be eating seasonally. I believe there is more health benefits from eating local produce. I love the reward and enjoyment of growing things, of creating an edible ecosystem. Nature is really very generous. It is expensive to buy organic and you can be sure food if safe - GE free and chemical free.

Upbringing and cost have an influence on one's decision to produce food at home as explained by participant No. 15 of Table 1, who says:

Reason for growing food; upbringing. I was given the example by my grandparents and mother and various other relatives. Health; home grown food is fresher. Taste; home grown food is tastier. Cost; I like eating organic food and could not afford to buy all my fresh produce organically.

Participant No. 15 also mentions self-reliance and helping the environment as other motivations to grow her own food:

I like to make do; independence and self-sufficiency. Growing my own food, I feel as if no matter what happens, I will be able to feed myself. Helping the environment; home grown food has a positive impact on the environment in comparison to commercially grown food.

Creating food security for the family and inspiring others to do the same are the reasons for participant No. 12:

To establish some food security for my family, and to inspire others to make similar changes to their lifestyles.

There are many other reasons mentioned such as the pleasure of gardening and eating organic food. For participant No. 14 from Table 1, some of the motivations are:
I love watching my vegies grow and love the sense of subsistence living it provides. I have an organic garden so know it is providing healthy food for us - it is personal passion as well as stewardship of the planet. I buy organic food so it makes veggies affordable to eat this way also. Always know we can eat out of the garden if low on bought food too.

For some of the participants, the need for their children to make the connection with where food comes from, and also to pass on the food growing knowledge are the reasons that motivate them. Participants No. 11 has this to say:

Main motivation since having children for them to see and help with growing and to know here produce comes from, to know how good it tastes fresh from the garden and to have an appreciation of home grown food.

Eating food that is in season, and the need to be in control and to help preserve heritage seeds are also reasons cited for growing food according to participant No. 6:

I know exactly what goes into the food I grow and I can control that input. I can grow varieties not generally available in the shops and I can contribute to the preservation of some old varieties that are not commercially viable. I can gather the produce when it’s at its best, not when it’s to transport it. I can cook within minutes of picking so my produce is nutritionally superior to commercially-produced produce. Mostly, I like to eat seasonally. For example, I have not bought a fresh tomato in the last five years (but I do process and freeze excess tomatoes from my garden so I have pasta sauce and pizza toppings available throughout winter). It gives me great sense of achievement and pleasure as well as plenty of exercise when preparing soil. It makes very happy.

For some, the main reason for growing food is for the relaxation and comfort derived from the whole process, from working in the garden to consuming:

I find it relaxing and also comforting to be able to pick food fresh and see all the preserves in the cupboard.
Chapter 6. Conclusion and Recommendations for Further Studies into Urban Backyard Food Production

With its polyculture and biodiversity, urban backyard food production in Melbourne produces a wide variety of fruits and vegetables covering both common and less common or less commercially available varieties. A total of 388.728 kg worth of food is produced from a total plot size of 1,096 sq. m. over a period of 12 months. Both size of plot and tenure have no bearing on yield and production capacity. Both produce and production methods and technology are experimental in nature in some cases. Otherwise, the produce tend to be of a similar nature, i.e. eggs, fruits and vegetables sometimes with quail and mealworms. Gardening practices tend to be organic with a few bio-dynamic practitioners.

The majority tend to adhere to proven methods of growing food such as raised beds, pots and containers. A few people are experimenting with less conventional backyard gardening practices such as wicking beds, roof gardening and hydroponics. Other urban food production concepts and techiques being used are aquaponic, backyard orchard culture, hydro garden, mini livestock (also referred to as entomophagy), permaculture and urban food forest.

The premise of this thesis is the capacity of urban backyard food production, and its potential to address urban food security issues. This study has found that this is a thriving activity with productive outcomes. It is diverse and experimental in its food production methods with equally diverse types of produce.

The overall trends, as demonstrated from the qualitative data, tend to be beneficial at many levels; from health and general well being to minimising one’s environmental impact on the planet.

Food production takes many forms within an urban setting. As illustrated, it is supplemental and not complete self-sufficiency. In regards to food security, it gives some control and ownership back to those who decide to engage in the act of food production by allowing the individual to experiment with production methods; by giving the choice to grow and consume organically produced food, and to grow or produce food of interest
to the individual. Surplus harvest is shared with others in the community and in doing so fosters a stronger community connection.

The notion of psychological well being is intangible and difficult to measure, however, those who are engaged in food production derive a certain pleasure, enjoyment and spiritual connection to nature through the whole process.

The thesis has successfully quantified the production capacity of urban backyard food production from the participants, as well as identified their motivations. There appears to be very little barriers in backyard food production within the participants.

As mentioned at the beginning of the thesis, the reason for the study is food security for city dwellers in relation to climate change and peak resources. With growth comes several repercussions, like the need for more housing and the disappearing of fertile agriculture land rezoned to accommodate the sprawl.

For cities to be resilient it is critical to address the issue of food security/vulnerability by examining its “ability to consciously shape the evolving urban form around sustainability imperatives” (Gleeson 2013, p. 312). The central concern here is to explore the many possibilities and potentials for restoring food production closer to where it will be ultimately consumed, i.e. urban neighbourhoods.

A study conducted in Toronto, Canada indicates that home food gardening contributes to community food security (Kortright & Wakefield 2011). The authors carried out an in-depth qualitative study into backyard food production and their findings resonate with some of the findings in this thesis such as health and nutrition, diversity of produce, food security and the sharing of surplus with the rest of the local community.

By providing urban residents with the means to produce for themselves diverse varieties of high quality produce, urban gardens can contribute to the food security of individuals, household and communities (Kortright & Wakefield 2011, p. 40).
Backyard food production is one aspect of urban agriculture which is nestled within the alternative food system. This could be the subject of future research in the area of urban food production, along with energy used; input and embodied.

To further encourage the growth of an alternative food system, like urban agriculture, planning policy has a role to play at both the state and municipal level. As an example, to create incentives for people to grow food in their backyard by offering rates’ reductions and other concessions such as the ability to sell surplus, both fresh and preserved without being subject to the same legislation as a commercial undertaking.

In its report, the Australian Food Sovereignty Alliance makes several recommendations to encourage the growth of urban agriculture. Some of the recommendations are: i.) by 2018, increase by 25 per cent the number of households with access to suitable land growing and raising their own food; ii.) all residents to have access to free non-hybrid seeds paid for by their rates; iii.) set a side a percentage of land with adequate sun access and uncontaminated soil in new private dwellings for food production; iv.) where possible, every urban area has at least 1 sq. m. of productive food pace per person; and v.) create a challenge to design modular, low capital-cost hydroponic and aquaponic food producing systems for commercial and non-commercial food production on suitable surfaces such as carparks, pave areas, suitable rooftops and walls so as to create opportunity for small-scale, specialist food producers, community food production and to contribute to food secure cities (2013, p. 20).

Given the right conditions and incentives, backyard food production could become an income generating food system while providing employment. This could be another subject for future research in this area.
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APPENDIX 1: Types of edible backyard produce

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APPENDIX 2: Data log-in spreadsheet

Name:
Suburb:
Type of garden:
Size:
Data collection period:
No. of people in household:
Rainwater tank size:
Compost, bookish, worm-farm (circle relevant practices)
Tenure-ship: renting, homeowner, other (specify)

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APPENDIX 3: Survey questionnaire

Q1. Type of garden (tick all applicable):
- Permaculture
- Raised bed
- No-dig
- Vertical
- Pots/containers
- Other (pls. specify)

Q2. Approximate size of food growing area

Q3. No. of people in household

Q. 4 Gardening practice (tick all applicable):
- Organic
- Bio-dynamic
- Aquaponic
- Hydroponic
- Conventional
- Other (pls. specify)

Q5. Compost
- Yes
- No

Q. 6 Worm farm
- Yes
- No

Q7. Rainwater tank
- Yes
- No
  If 'yes' capacity:

Q8. Tenureship:
- Renting
- Home-owner
- Other (pls. specify)

Q9. No of years engaged in food growing

Q10. Types of food (tick all applicable):
- Vegetable
- Fruit
- Egg
- Dairy
Fish
Other (pls. specify)

Q11. Do you consume all your produce?

Q12. Do you have any surplus? How much?

Q13. What do you do with your surplus?

Q14. Your reasons and motivation for growing food in your backyard?

Q15. Any other comments:

THANK YOU!
### APPENDIX 4: Responses to survey

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<tr>
<td>Yes, if possible but give away surplus</td>
<td>Yes, surplus varies with season and garden productivity, everything that we cannot eat is given away.</td>
<td>Give to friends at church, playgroup, at the local food swap, neighbours &amp; family.</td>
<td>Homegrown food is healthy, tastes better and has higher nutritional value than commercially grown produce. You can grow organic produce if you choose - including varieties that cannot be bought commercially. It’s very cheap to grow your own food, you know exactly what goes into the food because you grow it, and it’s part of a healthy lifestyle that reconnects people to nature, puts you in touch with the cycles of nature throughout the seasons of the year, and provides a healthy pastime working with and nurturing living things, which has many flow-on benefits, physical, psychological and spiritual.</td>
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<tr>
<td>No, mostly</td>
<td>Bags of nectarines and figs. Never measured this but will this year.</td>
<td>Give to friends at church, playgroup, at the local food swap, neighbours &amp; family.</td>
<td>Tastes so much better. I know what has been sprayed on it and what chemicals have been used. Usually cheaper than buying it - e.g. raspberry crop, I would have bought 9 kg of the shops. Used to buy blueberries (pick your own) but no need any more. Reduces transport costs - therefore reduces greenhouse gases. Happy chickens who have lots of space to roam produce wonderful eggs. Fits in with a lifestyle of trying to live more sustainably. Very little waste: soil, compost, mulch, as well as items and quantities to plant are carefully chosen.</td>
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<td>Q5. Most, some goes to our local vegetable swap</td>
<td>About a quarter</td>
<td>Local food swap, neighbours &amp; family.</td>
<td>I like to know where my food comes from. I think it is good to be as self-sufficient as possible and cut down food miles.</td>
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<td>Q6. Mostly</td>
<td>Yes, not all</td>
<td>Local vegetable swap</td>
<td>Food security, healthier, cheaper, fun.</td>
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<td>Sometimes, when things are ready to harvest all at once.</td>
<td>Sometimes, when things are ready to harvest all at once.</td>
<td>Give to friends and make preserves, food swaps.</td>
<td>You appreciate food more when you know where it comes from and have seen the amazing process of it growing. Home grown has the best flavour and freshness and I prefer to be eating seasonally. I believe there is more health benefits from eating local produce. I love the reward of enjoying growing things of creating an edible ecosystem. Nature is really very generous. It is expensive to buy organic and you can be sure food is safe - GE free and chemical free.</td>
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<td>8. No, I don't consume all my produce</td>
<td>Surplus varies - sometimes 75% of a particular crop, e.g. Chokos, but mostly only 10-20% on average, as I try to grow a variety of things with the idea of having home grown food throughout the year; so therefore I preserve, by dehydrating, freezing, bottling, etc.</td>
<td>Surplus gets shared with relatives, friends, neighbours, passers-by, food swaps and also sometimes sold at my Open Garden or at my classes.</td>
<td>Reasons for growing food - upbringing - I was given the example by my grandparents and mother and various other relatives; health - home grown food is fresher; taste - homegrown food is tastier; cost - I like to eat organic food and could not afford to buy all my fresh produce organically; satisfaction - I like to make and do, independence and self-sufficiency - growing my own food I feel as if no matter what happens I will be able to feed myself - helping the environment - home grown food has a positive impact on the environment in comparison to commercially grown food, convenience - having fresh herbs right there when I need them is much easier than going shopping all the time, variety - I grow so many foods that are just not available commercially, horticultural curiosity and challenge - I like to see the variety of food plants I can grow and it's fun to push the boundaries of what can be grown where, teaching and inspiring others - I get a great enjoyment from showing others how to grow their own food and by showing people what's possible, so they can see how easy it can be!</td>
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<td>9. No</td>
<td>It depends on the crop but we can often have about a third surplus to our needs.</td>
<td>We take them to a harvest swap and swap with other people or give it away or make preserves to give to people. With surplus fruit we make jam and wine!</td>
<td>Food security and teaching our kids about nature and self sufficiency. Also making sure that we can give our kids healthy non GM food.</td>
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<td>10. Yes, however some of my produce goes back into the system (i.e. growing excess warrigal greens to feed chickens)</td>
<td>Yes, about a quarter.</td>
<td>Give out to friends and family</td>
<td>To establish some food security for my family, and to inspire others to make similar changes to their lifestyle</td>
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<td>11. Yes, although give it away when excess and freeze produce in summer.</td>
<td>I tend to cook with seasonal produce anyway so just preserve and freeze excess. I have preserving facilities too.</td>
<td>Fowlers Vacola Unit and have freezer to store excess. I bottle tomatoes every year and use during the year. Mostly design meals around what is in season.</td>
<td>I love watching my vegies grow and love the sense of subsistence living it provides (I am a trained botanist too so addicted really!). I have an organic garden so know it is providing healthy food for us - it is personal passion as well as stewardship of the planet. I buy organic food so it makes vegies affordable to eat this way also. Always know we can eat out of the garden if low on bought food too.</td>
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<td>12. No. I don't eat it all myself but cook a lot of vegetables for my two dogs.</td>
<td>Depends on the crop but certainly less than 25%</td>
<td>I give it to friends and neighbours. Some of it is bartered (for eggs, perhaps). Anything left over goes back into the compost or worm bins.</td>
<td>I know exactly what goes into the food I grow and I can control that input. I can grow varieties not generally available in the shops and I can contribute to the preservation of some old varieties that are not commercially viable. I can gather the produce when it’s at its best, not when it’s best to transport it. I can cook within minutes of picking so my produce is often nutritionally superior to commercially-produced produce. Mostly, I like to eat seasonally. For example, I have not bought a fresh tomato in the last five years (but I do process and freeze excess tomatoes from my garden so I have pasta sauce and pizza toppings available throughout the winter). It gives me a great sense of achievement and pleasure as well as plenty of exercise when preparing soil. It makes me very happy.</td>
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<td>13. Yes</td>
<td>One fifth</td>
<td>Give it to neighbours and friends (particularly herbs or extra seedlings etc)</td>
<td>Enjoyment of gardening, environmental impact lessened, freshest, main motivation since having children for them to see and help with growing and to know where produce comes from, to know how good it tastes fresh from the garden and to have an appreciation of home grown food?</td>
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<td>14. Mostly with overflow to friends &amp; family</td>
<td>10-15%</td>
<td>Share/swap with friends/family</td>
<td>Reduce environmental impact (greenhouse, food mile, self-sufficiency, organic practices, etc.), healthier &amp; tastier. Creating a practical demonstration model.</td>
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<td>15. Yes, mostly.</td>
<td>Yes, about a quarter.</td>
<td>Share, swap, sell, preserve.</td>
<td>Food security - climate change and peak oil. Knowing the source of one’s food and knowing that it is organic and of course much cheaper.</td>
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