

PLANNING FOR REGIONAL FOOD SECURITY

A case-study of the Australian Capital Territory (ACT)

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Abstract

The development of strong local food networks could play a key role in the creation of socially just, environmentally sustainable and resilient food systems in the future. In order for the potential of these networks to be assessed, we need adequate local data on the four key food system components: food production, processing and transportation, consumer access and utilisation, and waste, re-use and post-use management. However, in many locales there is insufficient information gathered and analysed in relation to regional production and consumption of food. This inhibits the implementation of best land use planning and, potentially, compromises future food security. This paper presents a case study of the food system in the Australian Capital Territory (ACT), and demonstrates how knowledge gaps restrict the capacity to adequately plan for the Territory's food future. In doing so, the paper

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identifies key ways to fill these gaps to better inform the development of policy and planning practices adequately attuned to issues of regional food security.

Keywords

local food, Australian Capital Territory, land-use planning, food security.

Introduction

Fears raised about future food security, which exists ‘when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life’ (FAO 1996), have greatly intensified in recent years in response to the issues of peak oil and climate change. This had led to increased politicisation of the food system including what we eat, how it is grown, the methods of distribution and sale and the rising concern of food waste (Ingram, 2010). Furthermore, as the global population has become more urbanised, food consumption has become increasingly dislocated from sites of production (Steel, 2009; Norberg-Hodge, 2012; Potuhukuchi and Kaufman, 2000). The reliance on rural areas located increasingly further away from cities to feed a growing global urban population has required the expansion of distribution networks and has been accompanied by the rise of international agri-businesses and the concentration of retail outlet ownership (Steel, 2009; Gonzalez, 2012). This need to access food from distant locations means that cities are dependent on transport infrastructure and reliable and affordable access to fuel. In a time of peak oil, this introduces significant vulnerabilities into the food system that could compromise food security in the future (Cribb, 2010; Dey, 2010). The reliance on long distance transport also has environmental impacts as the need for fuel, packaging and refrigeration use is high. Increasingly we are also seeing evidence that this growing disconnection between consumers and the food system can have adverse effects on local economies and well-being in relation to personal and community health (DeLind, 2002; Lyson, 2004; Potuhukuchi and Kaufman, 2000; Steel, 2009; O’Kane, 2011).

The development of strong local food networks has the potential to reduce the social and environmental damage associated with the current global food system by offering a myriad of ways of reconnecting people to food (Brown and Miller, 2008; Sonnino and Marsden, 2006; Morris and Buller, 2003). Furthermore, food security depends on the integrity of food producing agro-ecosystems which strong local food networks could contribute to, simultaneously decreasing dependency on external systems of production over which consumers and local polities have little control. In addition to the capacity of local food systems to make food available to consumers, connecting with local producers may have an intangible educative function. Engaging with producers of food and their products has an important convivial aspect which is lacking when a consumer merely accesses mass produced food products from a supermarket shelf. By engaging more closely with producers, consumers can learn more about where their food comes from and this can encourage them to value it and the labours of those who produce it, over and above passive economic exchange (Brown and Miller, 2008). This educative function can be an additional reason to encourage local food systems, even if the total volumes of food that they make available are insufficient to significantly contribute to total volumes consumed.

However, in order to create engaging and resilient local food networks, their development must be supported by appropriate regional land use planning that incorporates a comprehensive assessment of the key components of the food system. For this study, we have drawn on the four key categories identified within the *Food Sensitive Urban Planning and Design guidelines* (Donovan et al., 2011) developed by the Heart Foundation and the Victorian Eco-Innovation Lab (VEIL) at the University of Melbourne, with partial funding from VicHealth. These categories are: food production; processing and transportation; consumer access and utilisation; and waste, re-use and post-use management. This paper uses a case study of the Australian Capital Territory (ACT) to investigate the types of information required in each of these categories for successful and effective land use planning attuned to ensuring future food security in Australian cities and towns.

Case study: Australian Capital Territory

The case study is based on research conducted in 2012 on behalf of the ACT Government's Environment and Sustainable Development Directorate. The ACT, which includes Australia's capital city, Canberra, has a population of approximately 350, 000 and is located within the Australian Capital Region (ACR), an area encompassing the ACT and the surrounding 17 local government areas in the state of New South Wales (NSW) and covering 5.86 million hectares. Since its inception in the early 1990s, the ACR has featured in ACT policy documents. Recently, this has been emphasised in relation to food with the ACT Legislative Assembly's Standing Committee on Climate Change, Environment and Water recommending "the ACT Government play a leadership role in ACR land use planning that preserves arable land suitable for food production throughout the ACR" (ACT Standing Committee on Climate Change, Environment and Water, 2012). As such, while this case-study focuses on food systems within the ACT in order to provide specific information that can be used by the Territory's Government to take action to promote the development of a more resilient local food system, it also contextualises this with reference to the broader ACR because, as we show below when discussing issues of consumer access and utilisation, this greater land area may play a key role in realising food security for ACT (as well as ACR)'s residents in the future . While much of the ACR land is unsuitable for cropping due to relatively poor soils and water limitations, it provides large areas of grazing lands for sheep and cattle, typically run by a few individuals as family businesses. Despite low productivity per hectare by world standards, the large size of farms in the region means that they produce a significant surplus for domestic and international consumption.

This paper is focused on identifying the key data sets needed to assist in the development of a food secure future for ACT residents. However, while we identify that this may be best achieved through cooperation and partnership with the 17 local government areas in NSW that make up the ACR, and thus we include data on food production and consumption in this greater region, we identify a number of action items that can be taken by the ACT Government alone to provide a solid basis for future inter-governmental negotiations. We focus on action in the ACT as it falls

under the one legal jurisdiction allowing policy to be more rapidly developed and implemented to directly address the identified knowledge gaps. This focus on the ACT also reflects increasing community and public interest in the issue of food security.

Over the last decade, the population of the ACT has shown a growing interest in food related issues, including sustainable production and food security (ACT Government, 2011). The *Time to Talk: Canberra 2030 Outcomes Report* in 2010 confirmed this, and demonstrated that the public interest in food relates to three key areas:

- environmental (carbon/food miles, water and waste);
- social concerns (disconnection from food system, viability of local food production and retail, and health); and
- economic concerns.

This interest has manifested itself in the desire of many ACT residents to see productive local agricultural lands remain available for food production as detailed in the 2011 public consultation associated with the ACT's *Draft Planning Strategy – Background Paper 5: Food*. In this document, ACT citizens were particularly interested in maintaining food production in peri-urban areas, but also expanding local urban food production and distribution initiatives in the form of city farms and farmers' markets (ACT Government 2012). At the same time, there have been a growing number of grass-roots and community initiatives building momentum around issues related to food security and sustainable urban living more broadly. Notably these include: the increase in community gardens in the ACT run by the Canberra Organic Growers Society as well as several other church and community-based gardening initiatives; the development of the Canberra City Farm group; the introduction of Urban Agriculture Australia. There is also the community-focused Canberra Environment Centre which runs workshops and provides a lending library. These initiatives are designed to promote and educate the community about the food system in order to strengthen local economies, reduce environmental impacts and increase the resilience of communities and their social fabric.

However, despite rising community and political concern about food security and the significant economic and social role agriculture plays in the ACT, there is a lack of full and accurate data available on food production and consumption practices and thus, an insufficient basis upon which to assess the potential role of local food in relation to future food security. The paucity of data means that it is not possible to specify the exact amount of food produced in the ACT in terms of both commercial and civic agricultural production and processed food products. It is also not possible to determine exactly what food products are eaten by residents, nor where they are bought or how much food is wasted after purchase. This lack of data on local food practices is a significant impediment to the adoption of best land-use planning practices which adequately attend to the realities of food production and consumption in the region. This paper aims to identify the key gaps in our knowledge and understanding based on our preliminary investigations of the literature and propose ways of attending to these. We acknowledge that as our research, and that of others, proceeds, more knowledge gaps may well be identified. However, in order to contribute to this developing area of research we start the analytical process in the following section by exploring both what we know, and what we *need* to know, about the four key components of the food system in the ACT itself – that is, within the 2,400 square kilometres governed by the ACT Government.

Food Production

This section identifies the data we have about the type, quantity and location of food production in the commercial and private (community/personal) spheres in the ACT. The existing data identifies the perpetuation of a traditional focus on large-scale and/or commercial food/agriculture enterprises. However, it also shows that there are significant limitations to the gathered data as the dominant information source, ABS Agricultural Commodities surveys, do not yield sufficiently fine-grained data. Thus, this prevents clarification of exactly what is produced, where and how. Furthermore, we identify the lack of attention to smaller scale civic agriculture in existing research and policy, despite growing evidence that these sources could play an important role in supporting urban food security in the future.

The 2010–11 Agricultural Commodities survey for the ACT recorded 58, 286 hectares of agricultural land holding in the ACT and 75 agricultural businesses (ABS, 2012). However, the Australian Bureau of Statistics (ABS) advises that the majority of this data should be considered as estimates and used with caution. Moreover, not all of these businesses are necessarily engaged in producing food intended for human consumption as the data also incorporates: hay and silage (4 businesses); nurseries, cut flowers and cultivated turf (5 businesses); sheep, which are likely to be used for wool (32 businesses have sheep – data is not separated into meat and wool) and horses (5 studs and 23 other businesses with horses). It is possible that some of these agricultural businesses are also engaged in food production, making a precise figure of food-producing businesses difficult to ascertain.

Tables 1 and 2 show what is known about plant based and animal based production for human consumption respectively in the ACT for the 2010–11 period.

Commodity	Quantity	Number of businesses
Wheat	385 tonnes	2
Tomatoes	1 tonne	1
Herbs	1 tonne	1
Other vegetables	Unknown	3
Plums	1.34 tonnes	1
Apples	19.492 tonnes	3
Pears	1.228 tonnes	3
Grapes	59 tonnes	2

Table 1: Plant based food production for human consumption

Commodity	Quantity	Number of businesses
Eggs (Chicken)	1, 171, 756 dozen eggs	6
Poultry (other than chicken, meat production)	25 'other' poultry	1
Sheep (principally for wool production)	54,092 sheep	32
Goats	1,035 goats	1
Cattle (meat production)	8, 807 cattle	51

Table 2: Animal based food production for human consumption

Land area, production and yield are not provided for all commodities due to gaps in the ABS data indicating the need for more detailed evidence to be gathered to ensure adequate understanding of current land use. For example, the available ABS data

sets fail to capture details of the ACT's niche producers such as a truffle farm in the Majura Valley which is located on 182 hectares of land in an area which is a hotbed of niche rural producers ripe for potential food tourism ventures.

The land able to be used for agriculture in the ACT is controlled by the ACT Territory Plan through the zoning of land for Non Urban uses. These zones are: broadacre; rural; hills, ridges and buffers; river corridor; mountains and bushland. Animal husbandry is prohibited in all land use zones except broadacre, and industrial land cannot be used for agricultural production.

The ACT 2011-12 annual report from the Office of the Commissioner for Sustainability and the Environment notes that 58% of land in the ACT is zoned for conservation purposes with approximately 11.4% for urban areas. Residential development is increasingly occurring on peri-urban land particularly greenfield sites, reducing the amount of arable land available for food production. Over the reporting period for 2011, 72% of residential development occurred in greenfield sites with a projection for the 2011-2015 period of 55% of these developments occurring on greenfield land.

While commercial production tends to be the focus of studies aimed at assessing food security and vulnerabilities, a growing body of research indicates that we should also be considering the role of private and/or community production and its potential production value (Pothukuchi and Kaufman, 1999, 2000; Drescher et al., 2006; Dixon et al., 2009). In fact a key aspect of global urban agriculture is the small-scale form referred to as "urban gardening," which can be divided into three categories: home gardens, allotment gardens and community gardens (Drescher et al., 2006). All of these forms of urban gardening are present in the ACT. Moreover, as testament to the growth in the importance, spread and potential production value of urban gardening, we have identified two more categories: school kitchen gardens and landshare arrangements.

In the ACT there are currently 18 public community gardens, 12 of which are managed by the Canberra Organic Growers Society (COGS). There are also at least 9 gardens in public housing complexes for the exclusive use of residents. A study recently completed for ACT Health has found that there are at least 77 food-producing gardens in ACT schools (Turner and Henryks, 2012). Landshare also has a presence in the city in both official and private schemes. The official scheme enables land seekers and those with backyards or space on their farms to register with an online site (www.landshare.com.au). In Australia there are over 2000 participants with an unknown number (due to lack of tracking) of people participating in the ACT. There is also a private landshare scheme run by a landowner on Canberra's peri-urban fringe currently involving approximately 20 participants.

Despite evidence of significant growth in these urban gardening enterprises over the last decade there is currently no official tracking, nor publically available estimates, of the type or quantity of production from any form of private urban gardening. The most recent wide scale data on home food production in Australia was gathered by the ABS in a 1992 survey on "Home Production of food" which focused on householder estimates of their production of selected food items (ABS, 1992). In the 1992 study, with the exception of wine production, capital cities produced less than non-metropolitan householders. However, Canberrans were more likely to be producing food than the populations of any other Australian city. The data shows that 41.2% of ACT householders (compared to national average of 36.1%) were producing fruit, and 49% (compared to national average of 34.8%) were producing vegetables.

While the 1992 survey is based on estimates, it found that around five per cent of all fresh fruits and vegetables in Australia were produced in urban home gardens (ABS, 1992). The above data suggests that there was a significant amount of home food production in the ACT, often outweighing the commercial production particularly in relation to fruit. For example, with plums as a point of comparison, in the 2010–2011 Australian Bureau of Statistics data ACT agricultural businesses produced 1.34 tonnes of plums whereas in 1992 householders produced 226.3 tonnes (ABS, 2012). A similar situation occurred with apples, with 19.492 tonnes produced by 3 commercial

businesses according to the 2010–2011 Australian Bureau of Statistics data set, whereas 179 tonnes was produced in the private sphere of production. Of course, there is nothing to ascertain what volume of any of this produce was actually harvested and consumed (ABS, 2012).

Research into the potential of urban or civic agriculture (including private/community modes of production such as community gardens) conducted at the University of British Columbia led to the conclusion that “food is an untapped economic opportunity” noting that the “purchasing of local food produced nearly twice as much local income as money spent on imported food” (in Larsen, 2008). The report claims that 750 square metres could add 425,000 Canadian dollars to the local economy each year and employ eight people. Obviously, unique soil qualities and climatic conditions have a significant impact on these figures, however there is currently no publically available data indicating that such assessments of food producing capacity and economic contribution have been conducted in the ACT, nor that there is any intention to do so. Therefore, we do not know what the potential production is in the region for commercial sector nor through private/community production. Further research is needed to assess the potential value of urban agriculture initiatives in the ACT. An important starting point would be the gathering of data on the quantity of what is produced privately, and gathering of concrete data on what is produced commercially in food categories currently not included in ABS data collection. As the majority of community gardeners in the ACT are members of COGS, this provides an accessible cohort of individuals where this data collection could begin.

Transportation and Processing

The issues of climate change and peak oil have played key roles in bringing attention to issues related to the next key element of the food system: transportation and processing. However, this attention to food system vulnerabilities and the impact of carbon footprints on future food security has given rise to concern related to infrastructure or in-built system “food miles”. This has tended to overshadow local evidence that peoples shopping habits (regular car trips and food waste) may in fact

make a more significant contribution to one's carbon footprint. Thus, we show in this section that there has been a lack of attention to how local food systems impact on carbon footprints, highlighting the need for further research on this issue to inform careful planning related to future local food initiatives, particularly in relation to transport and distribution.

The majority of food purchased in the ACT is transported on trucks via four main access roads making the Territory vulnerable to disruption of its food supply either due to road blockages or as a result of the rising cost of oil (Steel, 2009; Cribb, 2010). Indeed, recent concerns related to peak oil (Steele, 2009; Cribb, 2010) indicate that this would make it increasingly difficult for urban areas to ensure future food security. A study on the transportation of fruit and vegetables in Victoria identifies oil price fluctuation alongside extreme climatic events as the two key supply chain vulnerabilities (Marquez et al., 2010). Oil price increases have the potential to reduce availability of food, increase its cost and, thus, reduce access to food (this is particularly true of those in low socio-economic positions).

The food system in the developing world plays a significant role in our carbon footprint. For ACT residents, in 2008–2009, food contributed to 22% of their ecological footprint making it “responsible for the largest single category of the Territory's ecological footprint closely followed by provision of services to ACT residents” (Dey, 2010). A 2011 life cycle analysis of the typical products consumed in the ACT indicates that the use of cars to frequently procure food coupled with over-purchasing, and thus waste, makes a significant contribution to the ecological footprint of food (Ryan, 2011). This highlights the need to treat the issue of ‘food miles’ with caution. The impact of transporting food to Canberra is unlikely to be the most significant contributor to carbon emissions given bulk distribution and transport can be quite energy efficient as opposed to regular single person car trips to purchase food. It also emphasises the potential benefits of the population having close access to locations where fresh food is sold as a strategy for reducing car usage. Large numbers of consumers driving long distances to buy their food from farmers markets may well cancel out any putative value in, for example, the total embodied energy costs of accessing regionally produced foods. However, we do not have

adequate data to assess this and, thus, lack the information required to best plan for a food secure future in the ACT.

Access to processed goods and the inputs involved also need to be considered, however, there is very limited food processing in Canberra outside of the numerous suburban bakeries. Around two-thirds of the flour turned into bread sold in Canberra is grown in country NSW, milled in Sydney (Ryan, 2011), and baked in the ACT. There are currently no commercial dairy cows identified in the ABS data and no dairy in the Territory. While milk is no longer produced in the ACT, it and other dairy products, are processed and packaged at the Capitol Chilled Foods (Australia) site in Fyshwick. There is no capacity for commercial processing of animals in the ACT, and the nearest ACR abattoir no longer processes meat for small-scale producers. This is an impediment to small-scale farming businesses wishing to produce and process meat locally.

There is limited data on exactly what food products move in and out of the ACT given this is largely controlled by Coles and Woolworths, so it is difficult to determine exactly how (or if) access could or should be altered. Local food provisioning through Community Supported Agriculture collection points, mobile farmers markets or local food swaps offer ways of addressing some of the issues of car transport use. However at this stage the capacity to hold these in regards to where, what and how much food is produced as well as the willingness of residents to participate in these initiatives and their potential outcomes have not been studied. Thus, no cost-benefit assessment is available. Greater research is needed to assess the role local food may play in assisting with food security and how local production, processing and distribution can be most efficiently designed to reduce carbon footprints at a time of peak oil and climate change.

Consumer Access and Utilisation

The previous section highlighted the important, but often overlooked, role that individual consumers play in the food system in relation to carbon emissions. This small-scale focus on consumers is developed in this next key category of the food

system, consumer access and utilisation. Here we explore the available data on what ACT residents purchase and compare this to production data in an effort to determine the extent to which the ACT and broader ACR's food production could contribute to the Territory's future food security. We include the ACR in this section due to the region's larger land area providing potential for greater food production and due to the Governments of the ACR having previously identified the potential for future cooperative food planning. Here we also demonstrate that the current supermarket domination of the food selling sector is a barrier to determining where food consumed in the ACT comes from. This makes it difficult to understand the impact key supply system vulnerabilities may have on the ACT in the future. Furthermore, while local food options exist in the ACT, a lack of information around consumer behaviours in relation to local food, and how these could be altered if required, is also a hindrance to food security planning.

There is a lack of up-to-date information available on what foods are consumed in the ACT. As previously noted the lack of up-to-date on home food production prevents analysis of the contribution it does, and could, make to local production and consumption. As such, this section focuses on commercial enterprises drawing on data for the apparent consumption of 130 basic foodstuffs consumed by an average Australian resident which was gathered at a national level by the ABS up until 1998-99. Apparent consumption estimates the quantity of food available, how it is utilised, and the amount of food consumed by each person (ABS, 2000). This data makes no distinction between private and publically consumed food. It also does not account for wastage across the food system.

Despite the discontinuation of the data set, the ABS did generate an update providing trend estimates up to 2010. This update suggests that there have not been significant changes in the per capita consumption of key foodstuffs and, as such, it forms the basis for the analysis below (Espinal and Innes-Hughes, 2010). Table 3 picks out the main classes of foodstuffs consumed nationally and assumed to be consumed at equivalent rates in the ACT¹ showing the total per capita volume of each product type consumed in 1998-99². The population of the ACT is taken to be 1.6 per cent of the national figure of 22,620,554 (ACT Government, 2011). These

figures provide a reasonable indication of the amount of each product that is consumed in the ACT.

Main Product Class	Sub-category	Volumes p/cyr	Indicative total annual ACT consumption (tonnes)
Dairy Products	Butter	2.9kg	1060
	Margarine (table)	4.5kg	1644
	Cheese	10.7kg	3910
	Whole and skim milk powder	2.7kg	987
	Drinking milk	102.4L	37,419,000L
Meat and meat products	Beef and veal	36.4kg	13301
	Lamb and mutton	16.3kg	5956
	Pig meat (including bacon and ham)	28.3kg	10341
	Poultry meat	30.8kg	11255
Cane Sugars	As refined sugar	8.8kg~	3216
	In manufactured foods	33.9kg~	12388
Fresh Fruit (include fruit for fruit juice)	Citrus	56.4kg	20609
	Other	55.4kg	20244
Vegetables	Potatoes	68.0kg	24849
	Other root and bulb vegetables	24.4kg	8916
	Tomatoes	24.9kg	9099
	Leafy and green vegetables	20.6kg	7528
	Other vegetables	25.1	9172
Eggs and egg product		137 (equivalent number)	4,171,890 (dozen)
Grain Products	Wheaten flour (excluding bread)	16.3kg	5956
	Breakfast foods	7.9kg	2887
	Table rice	7.1kg	2594
	Bread	53.4kg	19513
Nuts	Peanuts	2.3kg	840
	Tree nuts	4.8	1754

*Table 3: Consumption
(~Figure is for 1988–89 due to unavailability of more recent data.)*

One way to assess the viability of a local food system is to investigate whether ACT producers can reliably provide these volumes of food all year round. This assessment would require identification of suitable soils, suitable produce for the soil and climate, and an assessment of the potential yield of the produce on the selected sites. Such planning was present in Burley-Griffin’s original plan for Canberra, as he understood landscape architecture to be “first concerned in understanding the

features and processes of the earth itself [;] the relationships of the configuration, the vegetation, the rocks, the soils, the waters [and] the very winds” (in Vernon, 1997 p. 6). The identification of fertile soils suitable for agriculture on the city’s peri-urban fringes of Canberra however, have now, in part be zoned for industrial use.

However, while such assessments should be carried out to assist assess suitable land-use planning strategies in the ACT, we should also look beyond the borders of the Territory to identify food that could be sourced from the 5.86 million hectares area of the ACR. If the ACT is to consider the ACR as its provisioning catchment then the consumption demands of people living in the ACR [the ACR excluding the ACT has its own population of about 245,000 (ABS, 2011 1308.8)] need to be added to total requirements.

ACR production figures in the year 2000 (the year which most closely matches the consumption data) for key 10 commodities selected from the consumption table are presented in Table 4.

Product	ACR Production (Tonnes)
Apples	20,525
Beef	36,576
Cheese	12,000
Chicken meat	5,607
Grapes	5,893
Wine	4,717
Lettuce	109
Milk – fresh	17,000
Milk – all dairy	142,816
Oranges	486
Potatoes	544
Rice	-
Sheep meat	30,061
Wheat	273,896
Pork	13,656

Table 4: Production

**Data from Australian Bureau of Statistics Agriculture statistics (agstats) 2005/2006*

How much could ACT consumption be met from ACT and ACR production?

Table 5 aligns Tables 3 and 4 by showing nine indicative products displayed in each. This suggests the potential scope for ACR consumption that could be adequately met by ACR production.

Product	ACR Production (Tonnes)	ACR Crude Consumption	ACR Production to ACR Consumption %
Sheep meat	30,061	7,033	427%
Apples	20,525	9,780	210%
Cheese	12,000	5,922	203%
Beef	36,576	18,384	199%
Wheat	273,896	251,110	109%
Pork	13,656	12,987	105%
Milk – all dairy	142,816	161,198	89%
Milk – fresh	17,000	52,864	32%
Chicken meat	5,607	19,874	28%
Wine	4,717	19,616	24%
Grapes	5,893	29,213	20%
Lettuce	109	4,336	3%
Oranges	486	18,447	3%
Potatoes	544	34,221	2%
Rice	-	23,678	0%

Table 5: Production to Consumption

**Data from Australian Bureau of Statistics Agriculture statistics (agstats) 2005/2006*

Table 5 demonstrates that the ACR, including the ACT, could be self-sufficient in a number of food products. However, these products do not always correspond with demand.

These figures also indicate that the ACR, including the ACT, could be self-sufficient in fruit, but again, this would require a shift in consumption preferences away from imported exotics, such as bananas, to fruits such as apples and plums that readily grow in the region. There are also a number of foodstuffs that are commonly consumed in the ACR that cannot grow in the region, or which could only grow there under highly artificial conditions. These include rice, tea and coffee. Another issue with using such production and consumption figures is that they do not account for food wasted post-purchase. However, from these figures we can see

benefits exist for the ACT identifying itself as part of the ACR and working with the 17 local government areas to develop a future food security strategy.

How much of ACT consumption is currently met by ACT production?

The percentage of ACT consumption currently met by ACT production currently cannot be determined. Two vertically integrated companies overwhelmingly dominate Australian food retailing: Woolworths and Coles. Although specific ACT figures are unknown, the major supermarket chains account for over 70 per cent of all grocery sales in Australia (DAFF, 2011), so it could be assumed that the majority of food consumed in the ACT is from these retailers. The ACT also has independent supermarkets, Supabarn and IGA, as well as outlets of international chains Aldi and Costco.

It is unknown how these companies currently maintain their inventories and there is no requirement for them to disclose where they purchase their products. It might be assumed, based on supply chain logistics, that much produce arrives from its nearest central dispatching point. However, there are a range of central corporate decisions concerning work load distribution, efficiencies and capacities of systems, and contractual arrangements that would also influence where products are sourced, processed and distributed. This means that a significant percentage of food consumed in the ACT may not be produced and processed locally.

Consumer motivations to engage in local and regional food purchases

The above discussion has shown that local food networks in the ACT, and the broader ACR, could make a significant contribution to the diet of ACT residents and, thus, assist in ensuring the future food security of the Territory's population. However, this may not occur unless local residents shift some of their consumption habits. In order for a strong local food movement to be established, it is essential that

local consumers are both willing and able to purchase food from local producers. Currently, purchases of local food tend to be sporadic and opportunistic. Even dedicated local food consumers tend not to purchase only locally produced food (Smithers et al., 2008).

In addition to making local food more accessible and affordable through alterations to retail and distribution systems, the purchase rates of local food could be improved through campaigns informing consumers of the benefits of local food (FSA, 2003). Research suggests that by appealing to values associated with food quality, strong community, human health, environmental sustainability, food safety, and having a range of food options, consumers could be encouraged to more actively support local food production (Winter, 2003).

There is little evidence that the major supermarkets in the ACT actively support producers in the region. The alternative IGA and Supabarn network has a little more discretion to retail regional produce, but affects a smaller percentage of the market and typically only for a limited number of product types. Yet, due to the legal ambiguity of the term local, many still label food sourced from anywhere in Australia as locally produced, possibly giving people the impression that they are supporting regional producers.

It is therefore essential that, if local food systems are to be supported, the accessibility and appeal of alternative retail outlets are strengthened to enable local consumers to support local producers. Retail outlets for local food currently in operation in the ACT include:

- Three farmers' markets (<http://www.capitalregionfarmersmarket.com.au> and <http://www.southsidefarmersmarket.com.au> which also manages a northside market)
- One food co-op (<http://foodco-opshop.com.au>)
- A farmer-direct operation with two retail outlets (<http://www.chokubaijo.com.au>)

- Home delivery box scheme, which involves weekly deliveries directly to homes of seasonal fresh fruits and vegetables (<http://www.canberraorganics.com.au>)
- A Slow Food convivium (<http://slowfoodcanberra.com>)
- Local/regional food is also sold at regular markets including Trash and Treasure in Jamison; Bus Depot Markets in Kingston, the Tuggeranong Homestead markets and Hall markets.

Overall, in relation to consumption we can see that, while there are some local food options available to ACT residents (and their growth demonstrates a growing interest and willingness in purchasing food through these outlets), we do not have local data on what people purchase, where and why. Thus, we cannot adequately assess people's willingness to buy locally nor determine what forms of education campaigns might be needed to further encourage local consumption

Waste, Re-use and Post-Use Management

While previously overlooked, the final stage of the food system, waste, has been the focus on a growing body of research in recent years. Food waste occurs all along the food supply chain, with avoidable household food waste being one of the biggest concerns. It is estimated that up to 50% of food produced (Food and Agriculture Organisation of the United Nations, 2011), and 25% of food purchased in supermarkets ends up as waste (Waste and Resources Action Programme 2011). Applied to Australia, this translates to \$5–7.8 billion worth of food each year (Baker and Dennis, 2009). However, while research has generated these generic figures related to food system waste, there is a lack of data on how and why waste is produced and handled at the household level and what impact the food supply, distribution and consumption systems may have on these behaviours. This detailed information is important in reducing wastes and, thus, better understanding production needs and costs.

The ACT has been identified as the most wasteful Australian state or territory. Although the exact reasons are unknown, it is suggested that the ACT's relatively high average household income means that people can afford to waste more (Ryan, 2011). The amount of food wasted in the ACT has a significant impact on the amount of food that needs to be produced. This, in turn, affects land use planning for food production. Without sufficient data on waste, future food security cannot be adequately planned for. We do not know how much, what or why food is wasted. Without detailed data on peoples' daily food waste habits, it is difficult to assess what steps can be taken to reduce waste. While there are food waste education campaigns in Australia such as 'Love Food Hate Waste' in NSW and 'Zero Waste SA' in South Australia, we do not know how effective these have been. We need to know what and why people waste food to plan for the region's future food security and to develop effective education campaigns designed to reduce this waste. Waste needs to be integrated into food system planning initiatives.

Conclusion: Addressing the Knowledge Gaps

This study has identified a lack of data in relation to understanding the four key components of the food system in the ACT and the broader ACR. Here we provide a summary of the six key knowledge gaps we have found and provide suggestions for how the required information could be obtained and utilised to develop land use planning strategies better attuned to the issue of future food security.

Knowledge Gap One: Land use planning

There is a lack of research on environmental, social and economic factors related to the use of land in the ACT and ACR for food production. As such, there is a need to:

1. Identify the land currently available for food production in the ACT and ACR;
2. Ascertain the potential productivity of the land; identify and quantify the ecological impact of proposed food-producing/processing activities (including different forms of production i.e. organic, permaculture etc.);

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assess the economic impact increased food production from the land would have on the ACT

3. Identify and assess the risks and benefits of the land zoning and legislative measures that currently prevent food production in particular sites (i.e. urban orchards) and
4. Engage in community-wide consultation regarding its land use values.

Knowledge Gap Two: Food flows

There is a lack of consolidated knowledge and publically accessible information on where local food production, processing and distribution takes place within and for the ACT and ACR.

One way of addressing this is to develop an interactive, data-rich Regional Food Map which includes products that are locally grown, processed and distributed. It should also include data on retail outlets and links to public transport travel options to access these foods. This would provide aggregate figures for the ACT and ACR and enable identification of opportunities to support new activities including more Community Supported Agriculture/Food Box schemes and food swaps.

In addition this would assist in addressing Knowledge Gap four by identifying areas where consumers are least able to access healthy food options and local food and allow for consideration of development of 'sustainable' transport options, such as public transport to farmers' markets.

Further, completion of the regional food map would facilitate identification of those individuals and businesses involved in local food and hence enable them to increase their impact through a range of networking activities. To best succeed this would be developed in partnership with current community groups advocating for a food aware and food secure ACT (i.e. COGS, Canberra City Farm etc.)

Knowledge Gap Three: Production from urban gardens

There is a significant lack of knowledge about food production from smaller and non-commercial sources in the ACT. It is likely that urban gardens are the most significant producers in this category, with the most recent information from the ABS indicating that around five per cent of all fresh fruits and vegetables were produced in urban gardens in 1992 (ABS, 1992). There is consequently a need to determine the location of individuals who engage in urban gardening activities, what they produce, how much they produce, and how it is used or wasted.

A public survey supplemented with focus groups and semi-structured interviews would help improve knowledge relating to the profile of all urban gardeners. Provision of scales and a diary for recording food crop quantities could also be useful and could be readily distributed to community gardens managed by COGs as a starting point.

Knowledge Gap Four: Food consumption and wastage

There is a lack of knowledge on the availability, consumption and wastage of food amongst different demographic groups in the ACT and ACR. This food access issue is of particular relevance to vulnerable individuals including new immigrants, the elderly and lower socio-economic groups who may live in areas where they do not have access to food outlets – ‘food deserts’, or areas where they are surrounded by unhealthy food options – ‘food swamps’. The data about urban gardening discussed in knowledge gap three would assist identification of the capacity for local food swaps. And, when supplemented with ABS demographic data, could assist in pinpointing the most useful locations to improve access to local food and to capitalise on sustainable transport options.

Knowledge Gap Five: Food distribution and consumption

More needs to be known about the location of food sources outside the ACR. Also, it would be naïve to assume that ACR produce is necessarily consumed by the ACR

population before being shipped elsewhere. It is highly likely that many products move to central processing and distribution points and are then shipped back to consumers in, for example, Canberra. Thus, they may complete round trips of many hundreds of kilometres even when the site at which they were grown is just around the corner from where they are eventually consumed. There is a lack of data on where food purchased in the ACT has been grown and processed. Given most food is purchased from large national supermarket chains, access to their inventory management records would be required to address this issue.

Improved understanding of where food comes from is necessary for carrying out life-cycle analyses of key foodstuffs and, thus, crucial for assessing their environmental and economic impacts.

Knowledge Gap Six: Consumer Preferences

Finally, there is a lack of information on what consumers know, value and believe about local food in the ACT and ACR. It is not currently known what local food products are purchased and who purchases them, nor the likely acceptance of further local food products and initiatives.

A mixed methods approach combining quantitative survey data with qualitative interviews and/or focus groups among ACT residents could be valuable to identify consumer knowledge, values and beliefs related to local food. Information gathered through this research may assist existing and new local food businesses in providing food options that are attractive to customers. Further research could also investigate the potential development of a 'made in the ACT' or 'made in the ACR' brand to promote local consumption and food-based tourism in the region.

Overall, this paper has shown that there is insufficient data gathered in relation to food production, processing and transportation, consumer access and utilisation, and waste, re-use and post-use management in the ACT. We contend that the key knowledge gaps identified here prevent future food security from being adequately

incorporated into land use planning and future food security in the Territory. Local food systems may not be a panacea for food security, but currently we lack the data to adequately assess their potential contribution.

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Endnotes

¹This may be slightly misleading as the average ACT household income of \$1,400 is 24% above the national average which may lead to different patterns of consumption (ABS, 2005).

²It does not include items that the ACT cannot produce, including seafood, tea and coffee.

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