



Future of Food in the CBR-Quantifying Backyard Food Production (University of Canberra) 'CBRLocalFood' received grant funding from the Theo Murphy (Australia) Initiative managed by the Australian Academy of Science and the Australian Citizen Science Association.



Final Stakeholder Report
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CBRLocalFood: mapping and quantifying home and community food production with citizen science

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This is a final report to contributors to the CBR Local Food survey which ended in June 2023. We were able to extend the initial survey (Autumn - Winter 2023) to this winter (June 2024) to collect a complete growing cycle and two peak harvest periods. Conditions continued to be similar with above mean annual rainfall (700mm p.a.). We gained some great new contributors and increased our coverage to most suburbs in ACT. Ultimately our best and consistent data came from a core group of gardeners who we particularly thank. The project is now being written up for publication.

Background

Urban food production has been promoted as a pathway towards more equitable food security and resilience in the face of food supply chain disruptions and environmental sustainability (e.g. the influential Milan Urban Food Policy 2015). Previous research suggests that urban agriculture can have yields at least twice that of rural agriculture although with high inputs of material and labour and both higher and lower water inputs and carbon emissions depending on the crop, production system and local conditions (McDougall et al., 2019; Payen et al., 2022). Despite this, the existing contribution of citizens already producing food is often overlooked.

In Australia, many towns and cities are developing local food strategies. The Canberra Region Local Food Strategy 2024-2029 (ACT Government, 2024) is one such and this aims to increase local food production and consumption. Backyard food production is difficult to quantify and this has been identified as a knowledge gap since the first assessment of Food in the ACT (Turner et al., 2012).

This project was developed to describe and measure production by home and community food producers in Canberra, Australian Capital Territory. We recognise that doing this relies on the support of the food growing community and ideally should be done in a way that can represent the diversity of food production and producers. To do this, representatives from community organisations that produced food (see Table 1) were asked by our researchers how we might design and deliver such a project. We subsequently developed an online survey with a user questionnaire and weekly production data collection.

We trialled what we developed, refined issues, and launched the survey to capture peak harvest in late summer 2023. Two progress reports were made available to participants on our [Future of Food](#) website and we subsequently extended our survey.

Results

1. Design

Initial focus groups provided rich detail of groups (Table 1, n=16) involved in food production (reported elsewhere). Although commercial producers kept records what was measured varied, and for many community organisations supporting vulnerable people, quantifying food production was beyond their capacity. Schools require a dedicated curriculum to justify such investment of time. It was recommended to target interested people during peak harvest times (e.g. 6 weeks in Summer-Autumn; 4 weeks in winter, noting that few people grew for winter harvests) for maximum community support and return on effort. A range of ways to measure food production was thought to be useful so participants were asked to describe what they did and offered three ways of recording produce weekly: weighing on (own) scales, volume of shopping bag (divided by 10) and taking calibrated photo; eggs were recorded by number and honey per litre. Green shopping bag were measured by the research team at 100% volumes for a range of fruit and vegetables to allow translation of volumes reported. Photos of individual produce with a coin on the left-hand side on white background were required to estimate produce from calibrated photos (Figure 1).

Backyard Producers

- Canberra Region Homesteader Gp

Community Growers

- Canberra Organic Growers
- Canberra City Farm
- Canberra Seed Savers

Community Support

- MULCH (disabled adults)
- Canberra City Care, Charnwood (mixed)
- Companion House (refugees)*

Small Business

- Patchwork Urban Farm
- Manyways Urban Farm
- Ainslie Urban Farm
- Southern Harvest

Aged Care

- Kambara House

Schools**

- Merici College
- ACTSmartSchools: Sustainability Programs, Climate Change and Energy, ACT

Table 1 Stakeholders who contributed to initial discussions on project design



Figure 1 Produce quantification options

2. Data collection

The CBR Local Food survey ran from 25 Feb 2023-1 June 2024. It was initially advertised via community groups, flyers in nurseries and local media, and in December 2023 it was readvertised on Grow it Local, via the ACT Wellbeing Survey and again by media and flyers.

Ultimately 150 respondents provided 1637 data entries over two peak harvest periods and a complete 12 months.

The location of survey respondents' home or community garden in which produce was grown are shown by suburb in Figure 2. Respondents to the survey produced food at home (82%) or at a community garden (18%).

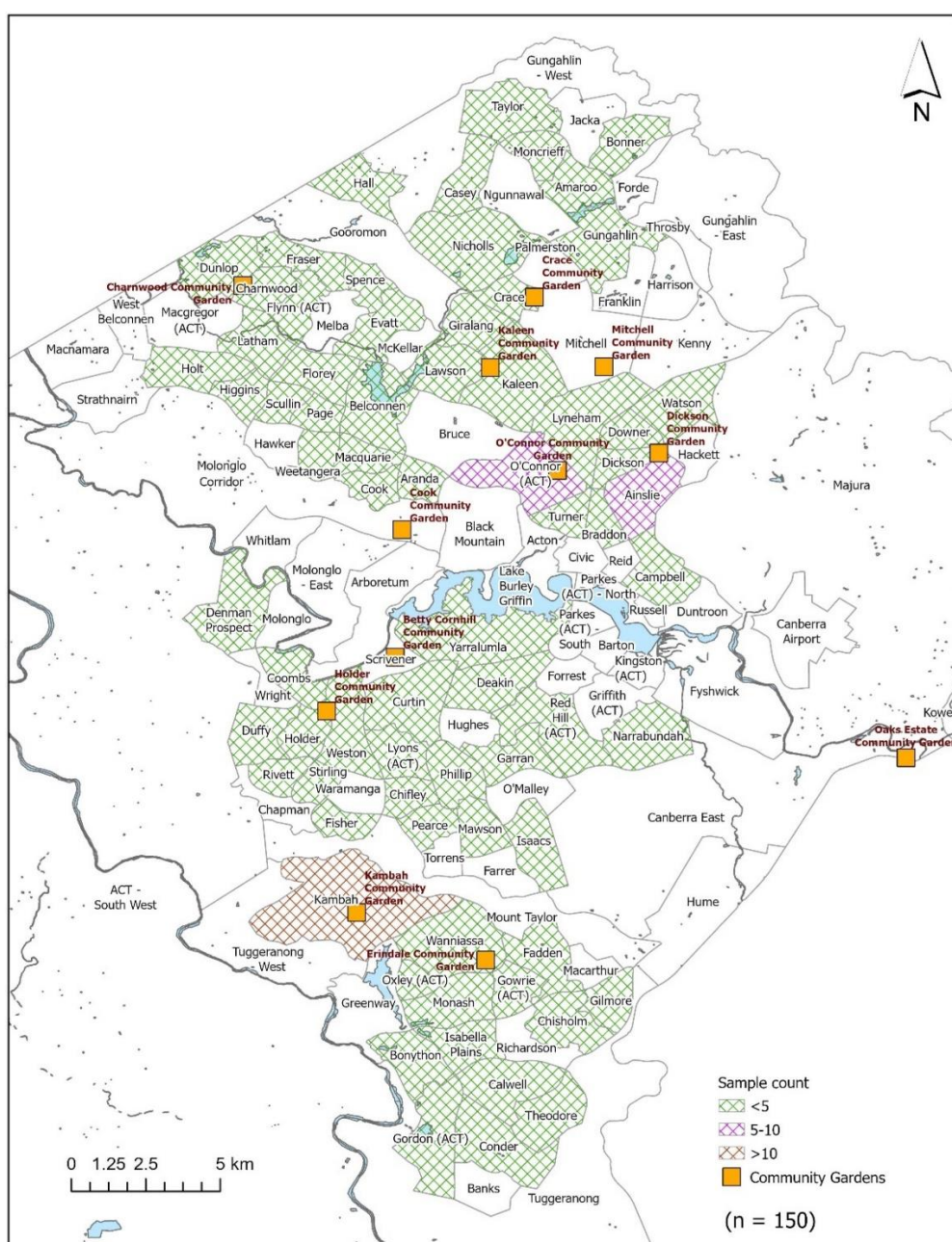


Figure 2. Location of survey respondents' gardens by suburb.

Demographics

Survey respondents were mostly female, older and experienced gardeners. Respondents were 74% female, 25% male, 1% non-binary; most were in full time employment (35%) or retired (34%). Respondents were distributed with 60-69 the largest age cohort (25%; although 7.1% of ACT population in 2021 census) in the survey. The majority (85%) of respondents were not born in Canberra but (49%) had lived and gardened here for >10 years. No respondents identified as Indigenous but 16.7% identified as CALD and ethnic origins from all global regions were reported.

Motivation and reasons

Survey respondents grew food for many reasons ahead of saving money. Respondents were able to nominate multiple reasons (see Figure 3). Relaxation, leisure, enjoyment was ranked first, followed by taste, wellbeing, supporting sustainable lifestyles, better nutrition and avoiding chemicals, ahead of saving money which was ranked sixth.

Although food was primarily produced for the gardener and their family's consumption, respondents also shared with friends and neighbours (51%), donated to charity (5.3%) or sold extra produce (1%).

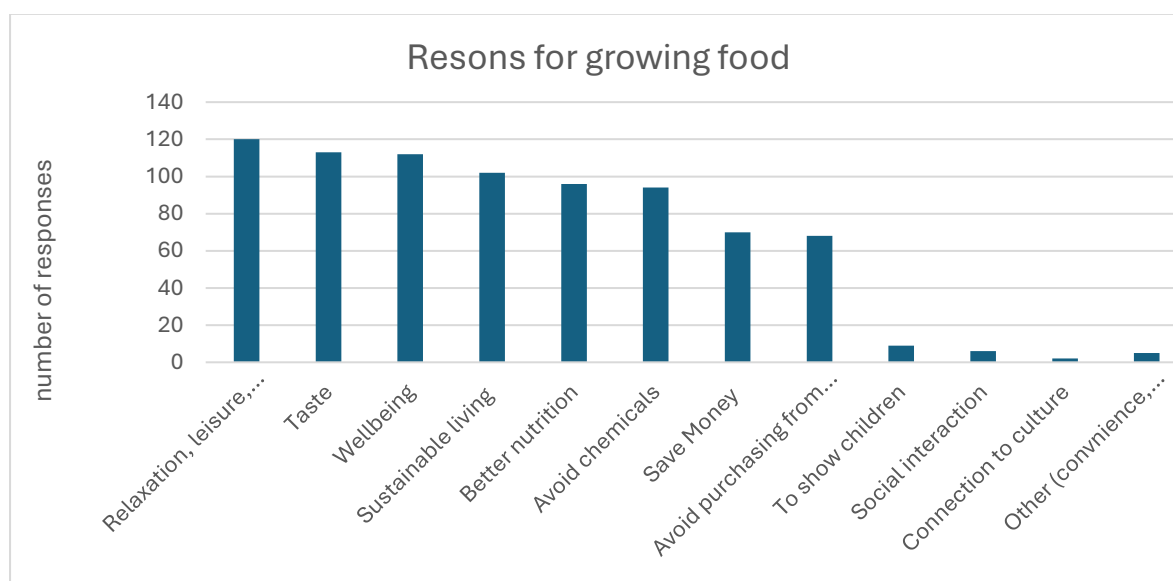


Figure 3: Reasons for growing food

All respondents produced vegetables, fruit or herbs and most (85%) described themselves as growing food all year. Almost a quarter also kept animals (including invertebrates): 21% had bees, 15% kept poultry for eggs and 0.4% reported keeping poultry for meat. Fish, worms and small livestock were occasionally kept.

Inputs

Producing food required buying, making or otherwise procuring multiple inputs. Figure 4 shows percentage of respondents who purchased or home produced compost, manure, mulch, fertilisers etc in the year. In addition, most people (73%) sourced plants from a national supplier although 57% were using saved seeds and smaller numbers purchasing online (7.3%) or from local nurseries (10%) or other local growers (28%) or sharing from community (25.3%) or friends

and family (6.7%). Most gardens were in raised beds, pots, containers of other, only 45% of plants were direct into the ground. We did not ask about materials for raised beds, pots, irrigation or netting as these are multi year investments but recognise these as additional costs.

Mains tap water was used by 88% of respondents and/or 47% used a rainwater tank and 7% used grey water, formally or by collecting shower or other water in a bucket, noting that the survey period was not during a period of water restriction.

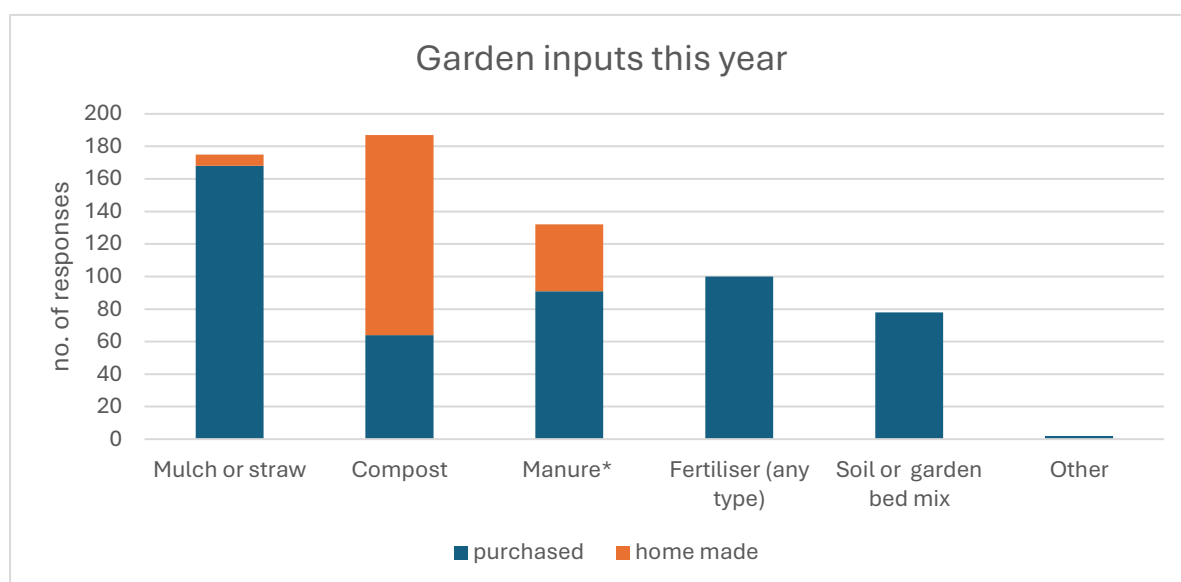


Figure 4: Inputs to garden soil this year

*"home made" manure includes worm castings, chicken manure etc.

Knowledge

Source of information and know-how is also a critical input. Websites and social media were reported as being used most frequently (n=122). Less than a third of respondents sought information from community groups and work shops but friends and family were an important source of knowledge.

Challenges

When asked what the greatest challenges to food production in gardens were, 62% of respondents listed wildlife (rabbits, rats, kangaroos, possums, cockatoos) damage, 53% suffered from exposure to direct sun, wind, and other elements, 44.6% listed overshadowing from trees with shade from buildings (21%), poor drainage (14%), insect pests (13%), poor aspect (9%), people (poor security from property damage) (5%), poor ground substrate (3%) and not enough pollinators (1%).

Outputs

Gardeners measured or estimated the area dedicated to food growing (guidance with common sized objects were provided).

Growing areas ranged from 2m² - 550m² with median 25m² across 150 plot estimations.

Calculating yield (food produced per area cultivated) was calculated from producers who provided complete annual data 2.3kg/m^2 - 5.7 kg/m^2 . This is based on citizen measurements and also accommodates fruit trees, perennials and variable design of garden beds often designed to accommodate other priorities. It is comparable to the small number of similar studies (for example 5.94kg/m^2 by Sydney gardeners ; 6.19kg.m^2 with median 2.74 kg/m^2 for six global studies also cited (Mcdougall et al., 2020)).

We also asked the number of plants harvests came from. This enabled an estimation of crop yield. See below regarding tomatoes.

Weight of all produce (fruit and vegetables) is aggregated by week and respondent and plotted below in Figure 5. Week 1 is the first week of Spring (at the start of September) through to week 52 as the last week of winter (at the end of August) so that the overlapping late summer- autumn harvest periods are superimposed. This illustrates the seasonal clustering of most harvest to approximately 60% of the year with extremes due to short duration large harvests from heavy or prolific fruit or vegetables like pumpkins. Early spring is the leanest period.

The Australian Dietary Guidelines recommend 5 serves of vegetables (c. $5 \times 75\text{g}$) and 2 serves of fruit ($150\text{g} \times 2$) equivalent to a weekly intake of 4.7kg fruit and vegetables. The red line in Figure 5 indicates a potential for this to be met (for at least one person) for more than 60% of the year from backyards- multiple people for more condensed periods

We recorded 56 vegetables or fruit reported greater than once (Figure 6). This does not account for a great diversity of herbs and multiple varieties of the listed fruit and vegetables (for example French beans, dwarf beans, broad beans, purple ‘magic’ beans are all recorded under ‘beans’). This fruit and vegetable diversity can provide valuable nutrient diversity in the diet. Note that [AusVeg](#) reports that for 2023 the top 10 most popular vegetables, judged on the basis of the proportion of households purchasing them on a weekly basis, were carrots, potato (both purchased by $>60\%$ of households weekly), tomato, onions, broccoli, mushroom, lettuce, capsicum, pumpkin and zucchini.

Tomatoes

Tomatoes were the most recorded weekly harvest so we asked some additional questions in the 2024 survey. Considerable preparation is required to get the best harvest. Seeds were started indoors as early as July through to September to enable harvesting to start mid to late December. Some plant seeds from August-November, with a variety of steps between starting, transplanting and protecting from potential frosts to get first tomatoes ripe in early to mid-January. Numerous people continue to produce tomatoes until winter (and into June).

We asked the number of plants harvests came from. Basing calculations on an ideal space for a full-sized tomato plant of 1m^2 we estimate yields of $1.5\text{-}2.8\text{ kg/m}^2$ over approximately 6 months, or $4.5\text{-}4.9\text{ kg/m}^2$ for 3 months noting that different varieties and inputs are not factored into these calculations and that taste rather than volume is a motivation.

For comparison, the [Australian Processing Tomato Industry](#) recorded 67.9 tonnes per hectare (equivalent to 6.79 kg/m^2) after a challenging 2022-23 season (the latest published figures), significantly less than 2020/21, when the industry’s highest ever average yield of 106.13 tonnes per hectare was recorded.

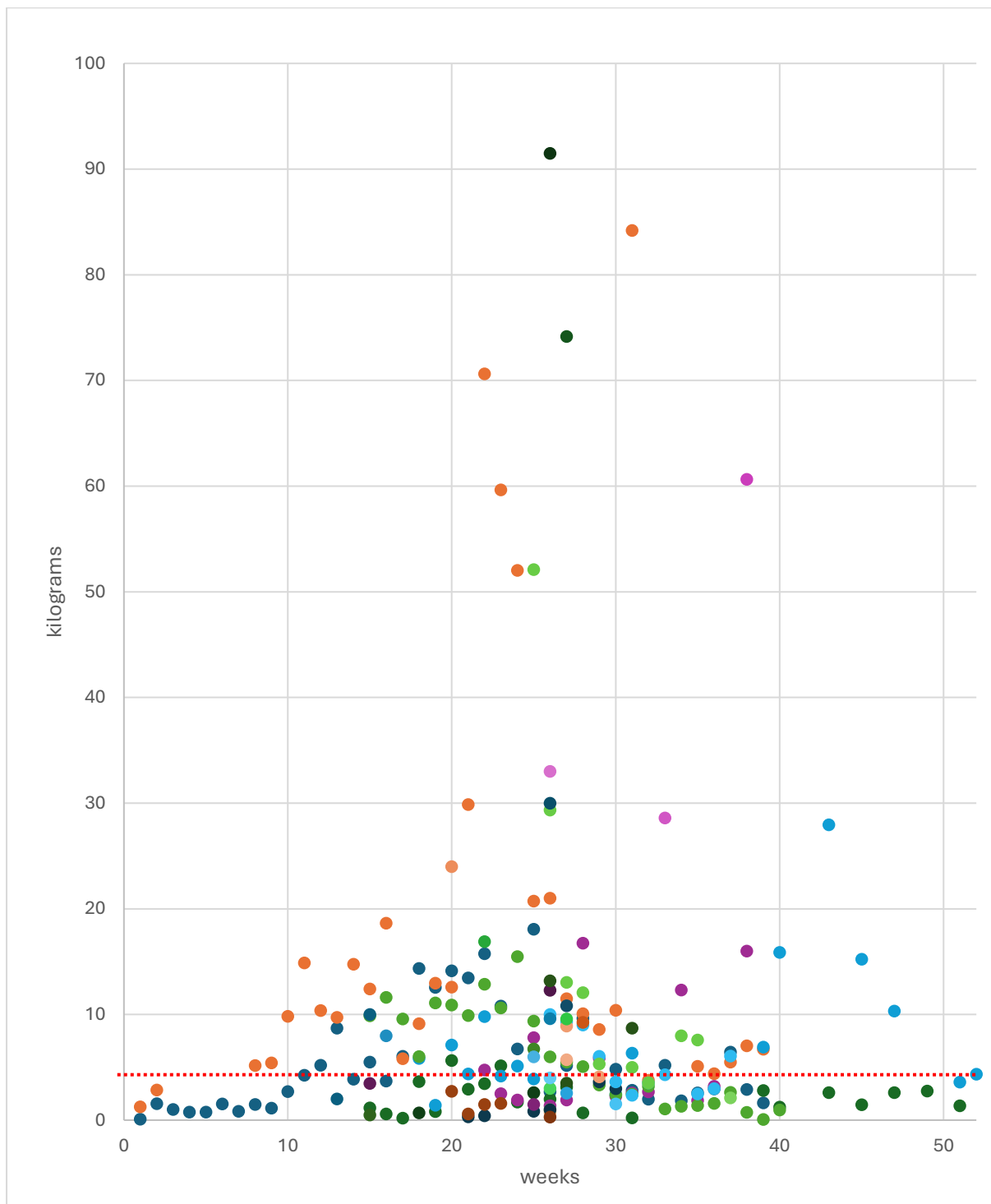
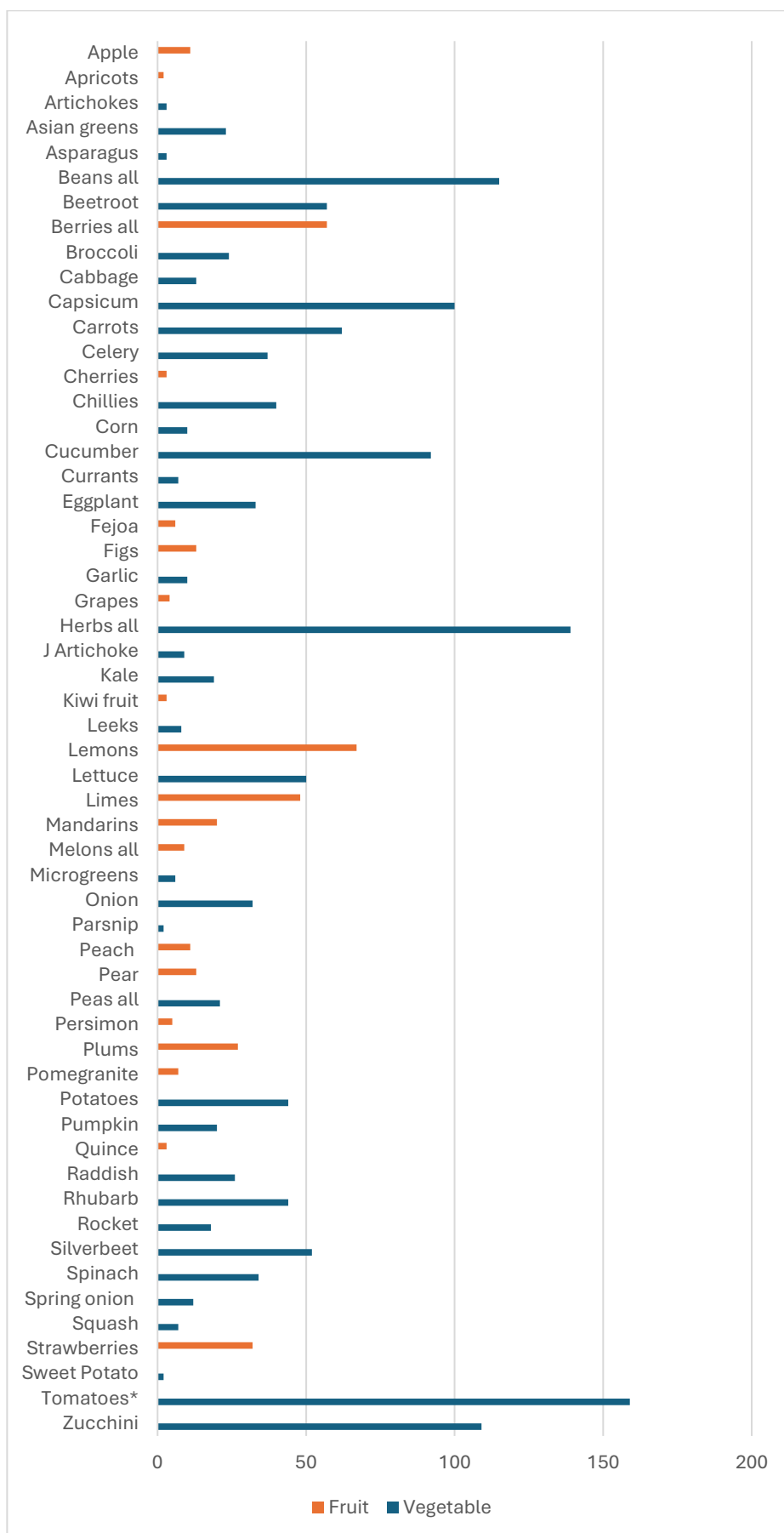


Figure 5: Aggregated weekly vegetable and fruit harvested per gardener 2023-2024.

Week 1 is the first week in Spring (1st September)- Week 52 the last week in Winter (31st August). Red line indicates the recommended intake of vegetables and fruit per person per week based on Australian Dietary Guidelines.

Overpage:

Figure 6: Diversity and frequency of Vegetable and Fruit harvested 2023-2024



Number of backyard and community food producers in the ACT

While this project cannot answer that question, this has been measured a number of times and it is somewhere between 40-50% of residents. According to the 2021 Census, the ACT population 454,501 so that is equivalent to 181, 800 - 227,250 people.

The Food Safety Council 2023 reported that 4 out of 10 Australians grew food. The Canberra Local Food Strategy says 40% of Canberrans grow food (citing Turner et al 2012). However in 2014, the Australian Institute surveyed nationally and reported 50% of Australians grow some of their food with only 1% growing this in community gardens (Wise, 2014). That survey reported that 48% of ACT residents reported to grow food but did not quantify what was produced. A national survey of Australian households (Australian Bureau of Statistics, 1992) also asked residents to estimate annual production. In that survey 49% of ACT residents reported growing vegetables, 41% grew fruit, 2.6% grew nuts, 2.3% had poultry for eggs and 0.4% had poultry for meat. The survey also reported 1000 tonnes of fruit, 3000 tonnes of vegetables, 12 tonnes of nuts and 102,000 dozen eggs and 1 tonne of poultry meat was produced pa in the ACT non commercially. At that time the ACT had a little under 300, 000 residents so this is equivalent to an average of 20.4kg vegetables per vegetable grower, 8.1 kg fruit per fruit grower, 14.8 dozen eggs per egg producer, and 833g of meat per meat poultry owner and 1.5 kg of nuts per nut producer per year.

Over the COVID -19 pandemic years 2020-2022 there was a resurgence of interest in household food production in Australia and overseas and an increase in enquiries to join the Canberra community gardens.

What these results mean

This report provides evidence, collected by Canberra backyard and community growers of a significant food producing effort by Canberrans. This can be compared with the small number of other studies producing similar measures for UA, and to commercial producers as we have done here.

It puts this in context of the demographic, motivations, inputs and challenges faced by the people who responded to the survey, and of what this productions means in terms of nutritional requirements.

Instead of asking people to recall what they produced over a 12 month period as done in the 1992 national survey above, it gives measured, weekly data.

What these results don't tell us

Because we don't have statistically significant numbers of participants compared to the estimated number of backyard food producers in the ACT we can't extrapolate from the data collected across the food growing population with (statistical) confidence. However, for the effort that would take (for ourselves as well as survey respondents) we believe we would not get much greater use from such data.

We can't validate all measurements reported. We offered scales, calibrated green shopping bags and white mats with standard sized markers for photographs in the initial trial but there was very low uptake. Most people found weighing with their own scales was most convenient. We also recognise that measuring a growing area is difficult if it is multiple beds of different

shapes and containers. We visited a number of gardens and considered this. Ultimately we resolved to accept the data as submitted except where it was unlikely to be accurate (based on order of magnitude), at which stage we contacted the data provider or if that was not possible removed the data.

We under represent the full cultural diversity of food grown and food growers in the ACT. Such surveys as this are not well suited to everybody. We ran a separate workshop with students of diverse cultural backgrounds at the University of Canberra to explore these challenges and these students helped to engage culturally diverse food producers in the community, including by translating the survey and transcribing responses. As our focus group at the beginning made clear, we are also underrepresenting food growers in aged care, schools, community support and refugees.

We did not quantify inputs. We considered doing this but decided that we needed to be judicious in what data we asked people to collect. There is a study from South Australia which quantified costs of inputs, hours worked and value of food produced of a small number of gardeners and one finding is that the returns in food production were equivalent to working for less than the minimum wage (Csortan et al., 2020). Saving money is not the prime motivator for the respondents to our survey but we also know from our focus groups that very few refugees continued growing food (at least initially) once a funded program ended because food could be purchased more cheaply. We make this point here because improving opportunity for backyard and community food production will not automatically improve food security for vulnerable groups unless cost is addressed.

Recommendations

It is important to know if the food you are producing is safe. We encourage people to have their garden soil tested. A citizen science project called [VegeSafe](#) has been run by Macquarie University that tests soil for heavy metals and other pollutants for free. Microbial and micro-plastic pollution through improperly treated grey water, faecal contamination from animals is also a risk. Good advice is available from the [Food Safety Council](#).

Many of the limitations raised above would be good to address, most need to be addressed by different types of studies.

It is also important not to forget that backyard and community food production is done for multiple reasons that are also important for health and wellbeing. Understanding the vulnerabilities of backyards and community gardens to further city development, and vulnerability to and roles in mitigating climate change is also important. Growing food in competition with trees and wildlife with encroaching developments and the challenges of climate change is a global challenge- innovative solutions are required. Answering these questions require time and money from researchers and invaluable citizen scientists.

Acknowledgements

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