

Gardening in Madison during the COVID-19 pandemic

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Abstract

The COVID-19 pandemic has been affecting people's social and physical wellbeing. Gardening is a way people have been adapting to the pandemic, as seen in the increased demand and subsequent shortages of seeds. We administered a survey (n=562) to examine how COVID-19 is affecting the cultivation of edible plants in home and community gardens in Madison, WI, focusing on gardening experiences and practices. Gardeners of all levels of experience indicated that the pandemic has impacted their activities. They disclosed various affective responses and practical solutions to these perturbations. Our results also revealed that people spent more time gardening in 2020. Furthermore, data from community garden managers confirmed that there were nearly no declines in community garden engagement. We conclude that our findings reflect gardeners' adaptations to the pandemic.

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Introduction

Governing bodies have implemented various social distancing measures and instituted stay-at-home orders to prevent the spread of COVID-19 (World Health Organization). In response to these measures, people have been panic buying and food hoarding. The New York Times associates these instances with “Americans [who are] shaken by how difficult it can be to find high-demand staples (Corkery 2020).” This has created an opportunity to rely on gardens as a source of food security (Katz 2020, pg. 1). Gardening can adhere to social distancing guidelines and provide food availability. During crises such as World War I and II, the US government rallied people, usually housewives, to plant victory gardens as patriotic responses to wartime food insecurity (Andreatta 2015, 39). Wisconsin played a major role in the victory garden movement as an agricultural state. Yet, little is known on how community and home gardening are addressing COVID-19.

This paper aims to explore how the COVID-19 pandemic is affecting community gardening and home gardening in and around Madison, WI. We focused on edible plants rather than other types, such as ornamentals. This allowed us to understand the connection between gardening and food access. These factors are important since they relate to physical, social, and mental wellbeing. We conducted a survey to explore these factors and gain insight into personal experiences and perceptions of gardening during the COVID-19 pandemic. This method admittedly relies on a limited number of perspectives, each with their biases and complexities. However, asking people about their experiences and perceptions is a great way to find emotional and behavioral trends that might not be as apparent using less interrogative methods.

To include more responses in our surveys, this research project adopts a broader definition of gardening. Our inclusivity is geared towards both the scale of cultivation and the

agricultural regimen, considering that some people could be growing a single edible plant in their household. The idea of gardening typically evokes a schema of planting edible foods such as roots, tubers, fruit, seeds, herbs, and other vegetables (Jones 2005, 165). This usually excludes cereal crops from Poaceae, including wheat and rye, which can be considered “field” crops rather than garden ones (Jones 2005, 165). However, we will include such plants as well. The main group we are excluding is the non-edible group. The pandemic is probably affecting gardeners of edible plants the most since food supply chains are in poorer conditions than they were before the pandemic (Soucheray 2020, 1).

Geographic Setting

Dane County is a unique location for this research because it has over 40 community food system organizations (Smith and Harrington 2014). Madison and the surrounding municipalities make up most of Dane County’s population, which was nearly 550,000 in the 2019 Census estimate (U.S. Census Bureau 2020). Its location in the Midwest means that summers offer a lot of direct sunlight for extended periods of time. It also means that winters challenge gardeners with subfreezing temperatures and frost for several weeks each year. In 2014, the Madison Urban Area, a major part of Dane County, had 60 community gardens (Smith and Harrington 2014). Madison is also home to many home gardens and the Dane County Farmers’ market, the country’s largest producers-only farmers’ market, which hosts about 275 vendors (Dane County). Given Madison’s rich history of gardening and the relative scale of its community-based produce system, along with the disruptive nature of pandemics such as COVID-19, one would expect to find corresponding changes in gardening experiences and perceptions. Since individuals are our primary source of information, most of the project’s

spatiality is at the local scale. However, phenomena at other geographical scales could possibly emerge in responses as well. Some of the emotions and motivations might be similar to those that occur in crisis gardening.

Literature Review

To better understand how COVID-19 is affecting gardening in Madison, we reviewed literature on various topics to support a holistic approach on crisis gardening. This choice of literature was central to our first theme, which is about gardening during crises and times of uncertainty. Since the COVID-19 pandemic is a time of heightened uncertainty, Victory Garden literature provided information that uniquely relates to what we expected to find in our research—food supply uncertainties have abounded during the pandemic. We chose our next topic, the impacts of COVID-19 on food supplies, based on these uncertainties. It was crucial to synthesize information about the effects of COVID-19 on food supply chains. This helped us understand people who were recently motivated to garden for food. Some of these new gardeners undoubtedly started gardening as a result of food supply disruptions. We highlight seed shortages during the pandemic as a key food supply issue specifically related to gardening. We distinguish between home gardening and community gardening, with respect to COVID-19, in various ways for our research. The literature review includes sources that introduce differences between these types of gardening. Lastly, we expound different gardening experiences, emphasizing the individuality of these experiences as well as the socio-economic factors that influence them.

Victory Gardens

Food production declined in the United States during WWI and WWII. To combat food scarcity, Charles Lathrop Pack created The National War Garden Commission to encourage Americans to plant gardens and increase food production (Herrmann 2015, 648). The National War Garden Commission reached out to Americans with posters and pamphlets (Herrmann 2015, 647). These gardens were called “victory gardens.” Gardening became a patriotic duty during these times, and even children participated by enrolling in the U.S. School Garden Army (Herrmann 2015, 648). Victory gardens became prominent in the United States, causing the number of garden plots to increase from 3.5 million to more than 5.2 million and thus increasing food production (Herrmann 2015, 648). By 1944, forty percent of fresh vegetables came from victory gardens. When the war ended, gardening activity declined and so did the number of gardens. Those who continued gardening did so for cultural reasons, leisure, or as part of a hobby (Schupp 2012, 107). The National Gardening Association reported that the percentage of people participating in lawn and/or garden activities has been decreasing since WWII.

The COVID-19 pandemic has become one of the largest public health crises (Lades 2020, 1). This crisis has caused panic shoppers to empty grocery shelves. In response to the shortage of food, there has been a strong interest in planting gardens during the pandemic. Local suppliers were reporting seed shortages (Wilkins 2020, 2) and in an interview with the New York Times, a farmer stated, “Like every seed company, we’ve had a huge uptick in sales” (Rao 2020). An increase in gardening activity during the pandemic makes sense in the historical context of crisis gardening. Resources are precious now as they were during the World Wars, including food resources. People are probably gardening in response to the uncertainties of the current crisis just as people gardened in response to wartime uncertainties.

Impacts of COVID-19 on Food Supply Chains

SARS-COV-2, the virus responsible for COVID-19, has been disrupting food supply chains by infecting workers in food production, distribution, and retail. Precautionary stay-at-home measures are reducing labor in the food industry, and current supply systems poorly adapt to abrupt changes in demand for things such as seeds. Large-scale responses like business closures have been increasing unemployment and slowing down economies, both of which greatly impact food supplies. This pandemic brought the shortcomings of the food supply chain to the forefront of public attention. While there could be lasting structural improvements to emergency preparedness and local food networks in response to the pandemic, some of the earliest solutions to food acquisition issues have come from individuals and communities.

Experts recognize COVID-19 as a threat to public health. Local, state, and federal governments have been using that threat to justify various shutdown strategies. Even though these shutdowns hurt some parts of the economy, they are implemented to prevent further spread. Labor changes during COVID-19, primarily attributes rising unemployment during the pandemic to economic restrictions (Larue 2020, 232). Although unemployment in the food industry disrupts supply chains, many governments focused their restrictions on non-essential businesses, thereby mitigating intentional large-scale supply shortages (Larue 2020, 232). Nevertheless, some precautionary actions still slowed down parts of the food supply chain. Countries like China delayed agricultural exports to observe quarantine periods on ships (Larue 2020, 233).

Some effects of these economic slowdowns include reduced accessibility and increased costs of certain types of food. This is especially true of imported specialty crops. Literature on community gardening during the pandemic expands on the general economic disruption

described by Larue in 2020. In the United States, immigrants and people of color have been experiencing food supply disruptions specific to imported cultural and specialty crops (Mejia et al 2020, 4). Americans now have less options for food due to closing restaurants and stores, and the unemployment associated with these closures reduces the consumption of fresh produce. As the consumption of fresh produce has decreased, so has the demand for them (Larue 2020, 234).

These closures negatively impacted the food supply chains, but the reasons for doing so were not unfounded. Some of the first COVID-19 hot spots in the United States were food processing plants. Even Wisconsin food processing plants had outbreaks, two of them being the Smithfield plant in Cudahy and the JBS plant in Green Bay (Soucheray 2020, 1). Outbreaks at processing plants compromise the processing stage of food production by endangering workers who would otherwise labor in those plants. COVID-19 indirectly hinders labor when people try to curtail its propagation, as seen with business closures. Some of these are businesses that supply people with food, like grocery stores and restaurants. Given a large enough disruption, the quantity and diversity of food in stores and restaurants will decrease as a result of labor shortages. Most of these aforementioned disruptions happen because of corporate or government responses to the pandemic. However, there are also disruptions that happen because of consumer responses to the pandemic.

Consumers aggressively competed for products, such as food, in the first few months of the pandemic, resulting in panic buying. Widespread food hoarding contributed to increased food insecurity among Americans, with over a third of Americans becoming food insecure in May 2020 (Shanks et al. 2020, 1133). While this was not necessarily a deficiency in food production or distribution, it still affected food supply at the individual level. For those who overcompensated for the pandemic's disruptive effects on higher levels in the supply chain, their

individual food supply likely increased. This behavior harmed others, who either failed to outcompete those who successfully hoarded food or decided not to purchase food in excess.

As usual, consumer behavior has also impacted higher levels of food supply chains. We previously mentioned how unemployed people, due to their reduced incomes, typically buy more processed food and less fresh food. These consumer tendencies have been happening during the pandemic. Farmers of produce operate at a loss as a consequence of decreased consumption of fresh food. Some farmers have relied on the government to purchase their yields (Larue 2020, 234).

Another important consumer change has been an increased demand for seeds. A combination of factors, such as impelling urges to stay at home for safety, complying to stay-at-home orders, spending more time at home due to unemployment, and decreased food availability, led to increased gardening activities (Picchi 2020, 1). More people began to order seeds when the pandemic struck, even to the point of seed shortages. Seed companies stopped allowing new orders in response to the surging demands, largely because they lacked the resources to satisfy them (Picchi 2020, 1). Accompanying this seed demand spike is a steadier increase in community gardening, which has been occurring for at least a decade (Mejia et. al 2020, 4). However, even compared to the increasing seed demand throughout the last several years, the increased demand for seeds in 2020 has still been enough to overwhelm the supply system. Individuals in SNAP can use their benefits for vegetable seeds, adding to the complexity of food supply shortages at the individual level (Wilkins 2020, 670).

Next, we want to consider preexisting issues with the global food supply since COVID-19 worsens their effects. One issue is that global supply chains contribute to a lack of preparedness for local shortages (Blay-Palmer et al. 2020, 518). When there are rapid changes in

global supply chains, regional and local food systems do especially poorly to make up for them. The overly general nature of global supply chains render them unaccommodating for local needs. Another issue is the compartmentalization of food systems into industries that should work in tandem more (Blay-Palmer et al. 2020, 518). For example, groups that specialize in reducing the carbon emissions of food production would cooperate with groups that specialize in streamlining the food production process.

Fortunately, these shortcomings are highly publicized in the pandemic, which could catalyze long standing improvements in food systems, such as the establishment of more emergency food organizations (Shanks et al. 2020, 1133). Although the literature focuses on increased food assistance funds and prepackaged emergency food kits, increased home and community gardening practices would improve food security and social morale for certain people (Blay-Palmer et al. 2020, 518). In fact, adaptations at the community level have important local effects. Some gardens are maximizing plot usage to feed more people. Some are instituting social distancing rules to provide people with a safe alternative to grocery shopping (Mejia et. al 2020, 4). So, people at all levels of the food supply chain are adapting to worsened food security. There is no incentive to have excess capacity and elasticity built into global supply chains in a capitalist system, since that reduces profitability. Thus, global supply chains are vulnerable to shocks such as the COVID-19 pandemic.

Community and Home Gardens

Community gardens are areas of land that have been collectively gardened by a group of individuals to plant a variety of edible and/or ornamental plants (J.Chan et. al. 2015, 1). In the U.S., people created community gardens to provide opportunities during economic and social

uncertainty. Community gardens can also help pandemic-related economic losses by supplementing nutritious foods (Mejia et. al 2020, 3). During the COVID-19 pandemic, The City of Madison in Wisconsin has recently created a program called “Got Dirt?” in an effort to implement school and community gardens to increase fruit and vegetable consumption.

The City of Madison has had a long agricultural history and has supported community garden initiatives. Currently, the City of Madison has about 60 community gardens and even hosts the nation’s largest farmers market (Smith 2013, 64). The University of Wisconsin’s Eagle Heights Community Gardens (EHCG) was established in 1962.

Home gardening is a type of farming system that provides physical, social, and economic function on land that is on or around the home (Lal 2020). It provides easy access to a supply of fresh food. According to Schupp, home gardens provided a way for individuals to psychologically escape the hectic urban life for a few moments each day. In Smith 2013, home gardens in Madison, WI, were described as containing “more home gardens than would be reasonable for a person to count”, indicating a plethora of gardens in the Madison community.

Understanding what people are growing in these gardens is also important for this project because different types of plants require more or less work and commitment. Annual plants dedicate more of their energy to creating biomass above the ground, which appear as flashy flowers, leaves, and exposed stems (Francis and Potts, 1). Perennial plants allocate their resources to strong roots (Francis and Potts, 1). Therefore, perennial plants regrow easily, even through Winters, because the roots can live in dormancy. Gardening with annuals, which usually need to be planted each year, requires less commitment in the short-term but more work to plant for consecutive years (Francis and Potts, 1). A study of nearly one sixth of New York City’s food producing community gardens found that annual plants took up the vast majority of agricultural

crop space (Gregory, Leslie, and Drinkwater 2016, 771). Based on the previous information, the community gardens in New York City have more plants that demand less foresight. It should be noted that New York experiences seasonality similar to that of Madison, with exceptions mainly relating to its coastal location. What people choose to grow definitely speaks to both the situations that people garden in as well as the decisions that individual gardeners make.

The extent of the COVID-19 pandemic and the long history and abundance of gardens in Madison, Wisconsin can allow us to understand how community gardens are affected in a pandemic context.

Impacts of COVID-19 on Gardening Experiences

COVID-19 impacts individuals differently, as the literature on food supply disruptions during the pandemic show. One important aspect of our research project is to study how people identify with their gardens and how COVID-19 might be influencing that. We expected a wide variety of results for this part of the project, since people usually have multiple reasons for gardening. These include fulfilling nutritional and sustenance needs, partaking in activism, recreating, and socializing (Lee and Matarrita-Cascante 2019, 6). The literature reinforces these expectations, explaining how past gardening experiences influence garden participation and how these different levels of participation relate to the effectiveness of gardens' beneficial functions. Findings from two of the sources apply to gardening before the pandemic, and the other one is specifically about pandemic gardening. However, the connections between these sources are rather apparent as we explain in this part of the review.

Social backgrounds and previous gardening experiences influences levels of garden participation, which in turn is important to overall gardening experience. As people work the

same garden for longer periods of time, they build stronger emotional connections to them (Lee and Matarrita-Cascante 2019, 12). The number of farmers in the United States is lower today than it was during the World Wars, especially in the contexts of Victory Gardens (Andreatta 2015, 39). This partially explains the fact that older people involved with gardens are also more likely to participate than younger ones (Lee and Matarrita-Cascante 2019, 10). They might feel more emotionally connected to the gardens than younger community garden members. Importantly, gardeners with more experience are usually going to be older. One of the most relevant findings is that people with past gardening experience are more likely to participate in gardening (Lee and Matarrita-Cascante 2019, 10). And, as we explained already, COVID-19 is confounding gardeners' abilities to get specialty crops. This is an example of how people can have different gardening experiences based on the types of food that they identify with or are familiar with cultivating. Some of these difficulties can discourage potential gardeners from participating, which could feed back into some of the poor conditions that prospective gardeners experience such as diminished food sovereignty.

To clarify, gardens are known to have benefits, but these benefits vary depending on the level of participation of a given gardener. Community gardening in particular usually has social dimensions such as interpersonal relationships and civic engagement. A study published in the *Journal of Community Practice* asked 115 people involved with community gardens questions about their overall health, exercising habits, perceived control and agency, life satisfaction, neighborhood safety, frequency of gardening, and garden organization (Booth et al. 2018, 10). Those who participated in their gardens more reported better levels of physical and psychological health than those who participated less (Booth et al. 2018, 15). This study's size is small, but its findings are intuitive, and studies at the community level show that public health

and community development benefit from gardening (Booth et al. 2018, 5). It makes sense that greater participation in community gardens would increase benefits for individual gardeners. Given that social distancing reduces social connections, higher levels of participation in community gardens are probably strong predictors for greater feelings of connection and community (Mejia et al. 2020, 5). However, one fascinating social phenomenon is how looser social connections mitigate stress better than stronger ones due to a lack of obligation (Booth et al. 2018, 5). Community gardeners exhibit the same social proclivity, and other benefits such as individual empowerment have also been strongly associated with distanced social ties (Booth et al. 2018, 5).

This summary is structured similarly to the analysis portion of the review, but focuses on how knowledge from each topic's literature pertains to those same topics in our research. Victory Garden literature provides a foundation of knowledge for how structures, communities, and individuals respond to crises with gardening while interacting with each other. This foundation is connected to COVID-19 in that the pandemic is a large-scale crisis, like the wars that popularized Victory Gardens. Some individuals are gardening in response to failed mainstays like food pantries, making up for what they would usually obtain elsewhere, just as some Americans gardened to make up for labor that others dedicated to war efforts. Therefore, we expected that some people in our research would report that they garden for reasons such as securing access to fresh food, controlling their food's production process, and addressing food scarcity.

Food supply chains influence people's decisions to garden as well as their abilities to do so. This means that literature about COVID-19 disruptions to food production, processing, and distribution describe important precedents for the states of gardening that we encounter in our

research. Aside from examining the various kinds of plants that people are growing, we also look into how gardeners are specifically responding to the coronavirus. We briefly showed that certain gardening behaviors such as increased seed buying are already linked to the pandemic. We also presented literature that describes food hoarding and acute food supply issues related to specialty crops, which, among other disruptions to individual food supplies, are possible reasons that people are turning to gardening or changing their gardening habits during the pandemic.

To make our research more specific, we look into how COVID-19 differentially impacts home gardening and community gardening. Thus, a portion of the literature review is dedicated to background information on these types of gardening. One of the most important differences between these two forms of gardening is the social aspect. COVID-19 is unprecedented for nearly everyone living in the United States. Restricted social interactions are new for many Americans as well. Community gardens and home gardens offer different social opportunities. Some home gardens might benefit several homes or families, while others could be strictly personal. Gardeners could also want the formal framework and support of community gardens during a time in which government support and vertically oriented food supply chains are faring poorly.

Finally, we summarize how gardening experiences differ between individuals during relatively stable times, which provides our research with a benchmark to work from when considering gardening experiences during COVID-19. To gain better insight into the effects of COVID-19 on gardening experiences, it is important to look into other factors influencing these experiences such as participation levels or prior experiences. Just as most of our sources rely on methods that focus on self-reporting, we also rely on self-reported information from people. For gardening experiences, individual surveys are very informative because individuals can explain

their personal experiences better than anyone else. Based on the literature, we expected gardeners with more experience to report more benefits from their activities and more connections to their gardens than people who recently started gardening. Since our literature review provides an outline for these trends in relatively stable times, it should be easier to find changes to gardening experiences within our own research that are related to the pandemic. We ask several direct questions about how COVID-19 is changing people's gardening experience, including gardening practices.

Methods

The aim of this paper is to conduct research on how the COVID-19 pandemic is affecting community gardening and home gardening in and around Madison, WI. We created surveys in an online survey platform, Qualtrics. We distributed them via email to UW-Madison advisors, scholarship cohorts, and community garden administrators. We asked these recipients to further distribute the survey via their email lists. We reached many of the community gardeners via The Garden Network, a group based in Dane County, Wisconsin. Surveys were administered between November 5 and November 26, 2020.

The survey entailed a standard Privacy Policy and Informed Consent Statement. The project's target group is people who partake in growing edible plants. Our emails explicitly said that gardeners of edible plants should participate in the survey. We also included a message prompting people to exit the survey if they were not gardeners of edible plants. The survey consisted of multiple choice questions, some single answer and some multiple answer, and short responses. One purpose of our survey was to get basic quantitative data relating to respondents'

gardening histories, garden types, and changes in their practices and experiences over time, especially since the onset of COVID-19.

An important question in the survey was, “Why do you garden?” This was a multiple answer question with various options. One option was related to food security, which originates from the food supply disruption described in our literature review, as well as the general tendency to garden for produce. Options also related to preferences such as general interest and leisure while others were about pressing motivations such as financial reasons, stress relief, and social connections. Finances drove the growth of Victory Gardens as much as food security did, with the country itself economically benefiting from people’s self-sufficiency. We predicted that some respondents are gardening for affordable produce, mitigating their overall financial burden. The survey then asked respondents where they garden and if that has changed since the pandemic. The combination of the why question and the where question can help us understand how gardeners’ motivations correlate with changes in their gardening locations.

Likewise, we want to understand the relationships between the cultivars that gardeners grow and the likelihood of changes in their gardening practices. This insight comes from answers to the next set of questions, which asked gardeners what kinds of plants they grow. To reflect the differences between annual and perennial plant cultivation that we described in our literature review, we separated the questions by edible annual plants, perennial vegetables, and perennial fruits and nuts. These questions were also multiple choice, with options including taxonomic rank names as well as common names of example plants in each taxon. Survey participants encountered Yes/No questions about changes in gardening habits. This set of questions explicitly asked respondents about how COVID-19 impacts the variety of cultivars in their gardens, the sizes of their gardens, and the amount of time they spend in their gardens.

The last two questions for all respondents are open-ended. We gave participants an opportunity to explain at length how the pandemic uniquely affects their gardening experiences. Having open-ended questions enabled us to acquire extensive information without overextending the survey with more questions. Open-ended questions allowed us to explore other factors that we undoubtedly overlooked.

Lastly in the survey, there were questions dedicated to only community garden managers and supervisors. We implemented two, one-dimensional matrix tables, one for each question about how community garden engagement in 2020 compares to previous years. The questions asked managers how the number of garden applications and the number of gardeners in 2020 compare with previous years. The matrix format for the response is balanced, with the options being “much less”, “less”, their equal counterparts, and “the same.” The final question was open-ended and asked managers to describe any changes in community gardens that have occurred since the onset of COVID-19.

Limitations

There were noteworthy limitations to our study. Under usual circumstances, these surveys could be distributed in-person as well as online. However, physical interactions are currently undesirable as they introduce the risk of COVID spread. Although interviews would prove useful for more in-depth situated knowledge, the limited time frame of this project meant that creating a quality interview would have been rather difficult. Some participants began the survey process but did not finish, which inhibited the sample size. We also only offered the survey in English, so participants who were not proficient in the language were unable to participate. Madison has a large population of Hmong and Spanish speaking communities in the

area. According to one community garden manager, Spanish speaking people in Madison are more likely to be gardeners and are more likely to be adversely affected by COVID-19. The Badger Fountain of Life, Burr Oaks, and Southdale gardens are affiliated with the Garden Network and offer descriptions in Spanish, indicating the presence of Spanish speaking gardeners in those places.

We limited our own abilities to conduct simple statistical analyses by making some of the survey questions multiple-answer. We were only prepared to do statistical tests on discrete data, but multiple-answer questions do not yield discrete data. If we would have implemented a ranked response question, then we would have had discrete data to work with. In the results section, we can only comment on the relative frequencies of responses for these questions. We focus our attention on the more insightful data, instead.

Two of the biggest limiting factors were time and money. As part of an undergraduate geography capstone course, our class had to brainstorm research topics, choose a topic, formulate research questions and goals, create and execute research methods, conduct data analysis, and present findings. Our class had one semester to do this without funding, which meant that our project would not fully scope the research topic.

Results

Out of the 562 respondents who began our survey, 478 partially engaged with it and 469 finished it. The end of the survey was designated for community garden managers. This end portion elicited 71 responses from managers of 23 different community gardens. It is important to note that one of these community gardens, the River Valley Area Community Garden, is located in Spring Green, which is in Sauk County. Despite being in an adjacent county, the River

Valley Area community garden is affiliated with Dane County gardens through The Gardens Network (Figure 10).

Raw Data

The first survey question asked “How long have you been growing edible plants?”. It was a multiple choice question with the following options and response counts. 54 (11.3 %) respondents answered “First Year”, 127 (26.6 %) answered “1-5 Years”, 68 (14.2 %) answered “6-10 Years”, and 229 (47.9 %) answered “11 Years Or Longer.” The next question asked “Where was your garden this year? (Check all that apply)”. 389 checked “Community garden”, 191 checked “Outside my residence”, 41 checked “Inside my residence”, 11 checked “Other”, 8 checked “At someone else’s residence”, 4 checked “In a greenhouse”, and 3 checked “On vacant land”.

The third question asked “Is this the same place that you gardened in 2019?” 365 (76.7 %) respondents answered “Yes”, 50 (10.5 %) answered “No”, and 61 (12.8 %) answered “I did not have a garden in 2019”.

Next, we asked “Why do you garden? (Check all that apply)”. 447 checked “Enjoyment”, 436 checked “Access to fresh food”, 342 checked “General interest”, 328 checked “Experience nature”, 316 checked “Stress relief”, 285 checked “Leisure”, 277 checked “Control how my food is produced”, 256 checked “Exercise”, 213 checked “Sense of community”, 163 checked “Social connections”, 65 checked “Financial reasons”, 47 checked “Other”, and 31 checked “Food scarcity concerns”.

The fifth question was “Did you plant any of the following edible annual plants this year (Check all that apply).” 456 checked “Solanaceae/Nightshade family”, 400 checked “Leafy greens”, 393 checked “Leafy herbs”, 388 checked “Cucurbitaceae/Gourd family”, 366 checked

“Legumes”, 339 checked “Root crops other than potatoes”, 297 checked “Brassicaceae/Cruciferous Plants”, 83 checked “Other annual plants”, and 53 checked “Edible grains”.

The next question asked “Did you plant any perennial vegetables this year? (eg. asparagus, rhubarb, sunchokes, etc.)”. 141 respondents (29.9 %) answered “Yes”, and 331 (70.1 %) answered “No.”

We then asked “Did you plant any of the following perennial fruits and nuts this year? (check all that apply)”. 113 checked “Fruiting ground covers, canes, and bushes”, 43 checked “Other perennial plants”, 31 checked “Trees with pomes”, 26 checked “Trees with drupes”, 23 checked “Fruiting vines”, and 9 checked “Bushes and/or trees that produce nuts”.

The question after that asked “As a result of the COVID-19 pandemic, did you plant more varieties of cultivars this year than last year?” 106 respondents (22.4 %) answered “Yes”, 301 (63.6 %) answered “No,” and 66 (14.0 %) answered “I did not have a garden in 2019.”

The following question was “As a result of COVID-19 pandemic, did you plant a larger garden or use more of your garden space this year than last year?” 110 respondents (23.3 %) answered “Yes”, 296 (62.6 %) answered “No”, and 67 (14.2 %) answered “I did not have a garden in 2019”.

The tenth question asked “As a result of the COVID-19 pandemic, did you increase the amount of time that spent at your garden?” 237 respondents (50.1 %) answered “Yes”, 175 (37.0 %) answered “No”, and 61 (12.9 %) answered “I did not have a garden in 2019”.

The last two questions for all participants were free response questions. The first of these two questions asked “How did COVID-19 affect your gardening practices this year?” 426 people responded to this question.

The second question in this section asked “Is there anything that you would like to share about your gardening experiences?” 226 people responded to this question. See our quote table for the short answer responses (Figure 9).

There were three questions specifically for community garden managers, as we indicated in our survey. The first question in this section asked “How did the number of applications for this year compare to previous years?” Zero respondents answered “Much less”, one (2.4 %) answered “Less”, 12 (29.3 %) answered “The same”, 23 (56.1 %) answered “More”, and 5 (12.2 %) answered “Much more”.

The second question in the section asked “How many people are gardening this year compared to previous years?” Zero respondents answered “Much less”, one (2.1 %) answered “Less”, 23 (47.9 %) answered “The same”, 19 (39.6 %) answered “More”, and 5 answered “Much more”.

Lastly, we asked community garden managers “What changes in community gardening, if any, have happened since the onset of the COVID-19 pandemic?” This was an open answer question that yielded 70 responses. Refer to the quote table for these responses.

Gardening Behavior and Practices of Respondents

Figure 1 displays the response percentage to 5 questions that were asked in the survey, and targets gardener’s practices/behaviors. The first question asks how long they've been growing edible plants. Over 60% (N=297) of our respondents have been growing food for 6 years or longer. A surprising number of people, 11.3 % (N=54), planted crops for the first time in a pandemic year for various reasons such as more available time, accessibility to fresh produce, and a way to go outside. A respondent stated “...COVID-19 partially drew me to gardening. I

wasn't sure if I would be able to go to the grocery store as much and afford to buy fresh produce so I wanted to plant my own so I could have some fresh veggies and outdoor activity (Figure 9).” Three questions in the survey focused on how COVID-19 impacted their practices such as planting more variety of cultivars this year compared to last year. Nearly 64% (N =301) of respondents answered no to planting more cultivars, while about 22% (N=106) answered yes and 14% (N=66) did not have a garden the previous year (Figure 1).

This question was examining how planting more cultivars and storing them could be driven by food supply scarcity due to the pandemic. Respondents wrote how they “...planted more crops that could be stored (frozen, dried, root crops),” and “...tried to plant more vegetables that could be stored into the fall/winter in case there were food shortages (Figure 9).” With food shortages occurring, some community gardens and gardeners mentioned how they have experienced garden theft, “...our garden experienced more "theft" from non-members than in other years (Figure 9).” The following question asks if COVID-19 pandemic increased the amount of time spent at their garden. The majority of respondents 50% (N=237) agreed that they have spent more time in their garden because they replaced their pre-COVID activities such as commuting to work to now working from home. One gardener said, “Working from home gave me more time during the day to attend to my veggies, so probably had better production than usual (Figure 9).”

One of our interests in this project is comparing the gardening tendencies of those who started cultivating edible plants during the pandemic and those who started prior to (Figure 1). 54 (11.3 %) respondents reported that 2020 was their first year gardening. Most first-year gardeners (N=47 or 87%) are cultivating in a community garden (Figure 1). This proportion is similar to the other groups, such as the proportion of those who have been gardening for 11 years or longer,

which is 181 out of 229, or 79%. This distribution of community gardeners' length of experience appears to be uniform relative to the distribution of the experience of those with gardens outside of their residences. This distribution has a positive slope. As length of gardening experience increased, so did the proportion of gardening outside of one's residence. Nine of the 54 first-year gardeners cultivated outside of their residence, or 16.7%. By comparison, 118 of the gardeners who have been cultivating for 11 years or longer do so outside of their residence, or 51.5%.

Comparing these two groups is important because 389 people cultivated in a community garden and 191 people cultivated outside of their residence, and all of the other gardening locations yielded less than 50 affirmative responses. This contrast between their distributions is interesting because it shows a possible difference in the tendencies of new gardeners and more experienced gardeners.

The lengths of gardening experiences also vary with respect to the likelihood of growing perennial vegetables. There appears to be an inverse relationship between the length of gardening experience and the likelihood of growing perennial vegetables (Figure 2). The four groups of gardening experience length is first-year, 1-5 years, 6-10 years, and 11 years or longer. The question about gardening perennial vegetables in 2020 is binary. 13% (N=7) of first year gardeners said that they planted perennial vegetables, which include asparagus, rhubarb, and artichoke. In increasing order of gardening experience length, 22.4%, 42.6%, and 34.2% (N=28, 29, and 77) responded yes to whether or not they gardened perennial vegetables in 2020.

This association between these variables, length of gardening experience and the growing of perennial vegetables in 2020, is statistically significant (Figures 2 and 3). We found this out by testing our hypothesis that these variables are not independent of each other. The null hypothesis would be that they are independent of each other. 472 survey participants answered

these two questions. There are expected values for each response combination, or cell, in the case that there is no association between the length of gardening experience and the cultivation of perennial vegetables. For example, there is an expected number of respondents who have been gardening for 6-10 years who did not plant perennial vegetables in 2020. That expected value, as seen in the contingency table, rounds up to 48. The observed value is 39. As the observed values deviate from the expected values, the likelihood that the two variables are related increases. Each response combination has a chi-squared value. That is the squared value of the difference between the observed and expected values, divided by the expected value squared. Using a chi-squared test to compare the expected values to the actual values of each response combination, we yield a total chi-squared value of 18.03. This is the sum of the chi-squared values of each response combination, and higher values indicate a greater likelihood of a relationship. In fact, the test yields a p-value of 0.0004, which indicates a very small probability that the variables are independent. The p-value is less than the smallest commonly used alpha level of 0.01. Therefore, we reject the null hypothesis that these variables are independent of each other.

To figure out what this finding means, we turn to some relevant quotes from the short answer questions in our survey. One gardener said, “Though I did not add any perennials to the garden this year it was because I have spent the last 8 years adding them to the garden and so they are mature and producing already - I felt very secure in their production and didn't have to freak out and worry about trying to grow food because I already felt like I had a lot (Figure 9).” Perennials take longer than annuals to produce high yields. This gardener seemed surprised to see such substantial output in eight years. First-year gardeners would not have enjoyed the same benefits from perennials.

We also want to compare the length of gardening experience with the cultivation of

perennial fruits and nuts (Figure 4). We formatted the question about the cultivation of perennial fruits and nuts as a multiple answer, with options including fruiting vines, pome-bearing trees, and drupe-bearing trees. The results in each of these categories points to an association between length of gardening experience and the cultivation of perennial fruits and nuts. In each of the six categories, except for “Trees with drupes (fruits with large pit in the middle) (e.g. cherries, plums, peaches, apricots, etc.)”, the lowest percentages came from first-year gardeners. For example, 16.7% of first-year gardeners said that they planted fruiting ground covers such as blueberries and raspberries. 18.1% of the 1-5 year group, 26.5% of the 6-10 year group, and 27.5% of the 11 years or longer group checked the fruiting ground covers option.

This inverse relationship does not appear to be as strong in the case of annual plants (Figure 5). Some annual plant categories, such as Brassicaceae and root crops (except for potatoes, which we categorized as Solanaceae), show similar distributions as the perennial plant categories. In these cases, larger percentages of more experienced gardeners cultivated these plants in 2020. However, there were a few categories that exhibited a more uniform distribution, such as leafy greens, leafy herbs, and Solanaceae. This was not the case for perennial plant categories except for the unique case of nut-producing trees, which yielded nine affirmative responses from the 11 years or longer group and zero from the other three groups.

Our favorite explanation for the statistically significant association between gardening experience and perennial vegetable cultivation, as well as the comparable trends between gardening experience and other edible perennial plants, and further still the weaker trend between gardening experience and annual plant cultivation, is that new gardeners could be prioritizing the near future. Recall that annual crops yield a lot in a given year and die off

thereafter unless they are planted again the next year. Perennials, on the other hand, do not require gardeners to restart the planting process but do not typically bear a lot in the first year.

We see some of this long-term planning in the responses to our open-ended questions. In response to “How did COVID-19 affect your gardening practices this year?,” one gardener said, “I was able to spend a lot more time in the garden this year so I developed [some] methods and planned out more perennial plantings and native perennial garden space for next year (Figure 9).” This type of quote falls into a general narrative of the garden as a place of opportunity during COVID-19. Some people with more free time are turning to the garden to increase productivity, enjoyment, and personal health. These same opportunities might present themselves to people who are spending more time outside to socially distance themselves from others.

Planning is arguably most important in times of uncertainty when confounding factors multiply. Many of the survey participants mentioned confounding factors, and many of them came up with brilliant solutions. Some Madison area gardeners missed out on their usual trips to farmers’ markets. One gardener anticipated that they “...may not be as able to get fresh food frequently at farmers markets and local stores” (Figure 9). Their concerns of disrupted food acquisition are justified. Another respondent remarked that their “... farmers market shopping was reduced pretty drastically” (Figure 9). For some people, the farmers’ markets became inaccessible. This is the account of one respondent:

“Usually I get a number of annual and perennial plants and herbs at the Dane County Farmer's Market on the Capitol Square. I do not have a car. The market moved to the Alliant Center, but it's not very convenient for me, so I did not go there (Figure 9).”

These are examples of the garden being a place of challenge during the pandemic. This narrative seems to fit people who already have an established gardening regimen. Now, as a result of the disruptive effects of COVID-19, these people have to adapt accordingly. Regardless if the outcomes of these adaptations are favorable or not, they usually require extra effort or at least an uncomfortable deviation from the norm.

Despite these barriers, some of the survey participants contrived methods to improve their pandemic experiences. Some people used gardening as their way to exercise in the pandemic. As one respondent put it, “We also were unable to do our normal gym schedule when they were closed, so the garden was a good way to get active during the pandemic” (Figure 9). There were also several indications of long-term planning in the survey responses, as previously mentioned. One gardener exemplifies a visionary mindset, even during the pandemic. This person grows a combination of plants that is able to sustain itself with little to no oversight. Referring to these interspersed “food forest gardens”, they said:

“I would love to see these food forests made a priority throughout human habitats, but especially in urban areas where so many people experience food insecurity even without pandemic conditions (and so many of them children). Imagine if these folks could count on supplementing the search for their next meal by foraging just about anywhere! (Figure 9).”

Gardeners are not simply reacting to the problems of COVID-19, but are proactively addressing several issues through their gardening practices. At the same time, gardeners in our study area clearly have unique obstacles to navigate in 2020. The garden seems to be a place of both opportunity and challenge during the pandemic.

Changes in Community Garden Engagement During the Pandemic

One of the more striking results of the survey came from the two multiple choice questions for the community garden managers (Figures 7 and 8). Both questions relate to changes in community garden participation since the onset of COVID-19. 41 people responded to “How did the number of applications for this year compared to previous years?” No one answered “much less” and only one community garden manager answered “less.” The other 40 respondents claimed that their community garden did not have less applications to their garden in 2020. In fact, 68.3% of them claimed that the number of applications for 2020 increased. 48 people responded to “How many people are gardening this year compared to previous years?” Like the previous question, no one answered “much less” and one answered “less.” About 50% of them said that more people gardened in 2020 than in previous years while 47.9% said the same number of people gardened in 2020.

It is remarkable that one out of 41 and one out of 48 respondents indicated a decline in community garden activity while over 20 indicated an increase for both variables. These managers were from all over the Madison area, as the map of responses to this question shows (Figure 10). This spatial distribution is beneficial to our study because it closely matches the spatial distribution of the rest of the respondents in terms of extent. The reported positive trends in community garden engagement can be seen across Dane County.

As mentioned in the methods, one possible association that we want to explore is between garden location and gardening motivation. We anticipated that the disconnecting effects of the pandemic would compel community gardeners to garden for social reasons more than home gardeners due to the social aspects of partaking in a community garden. “Inside my residence” and “Outside my residence” are the two gardening locations that logically fall under

the category of home gardening. Figure 6 compares the proportions of respondents to the question “Why do you garden?” with the responses to the question “Where was your garden this year?”

This association is not favorable for simple statistical analysis because both questions provide the option for multiple answers. However, the graph shows that each reason for gardening had similar proportions of respondents from each gardening location. Interestingly, the proportion of community gardeners who reported social connections as a reason for gardening was higher than both home gardening proportions. 38.3% of the 389 community gardeners, 31.9% of the 191 people gardening outside of their residences, and 26.8% of the 41 people gardening inside of their residence reported that they gardened for social connection. Also notice that a larger percentage of those who gardened outside of their residence did so for social connections than those who gardened inside of their residence. Likewise, the proportion of community gardeners who reported to garden for a sense of community was higher than the home gardening proportions. These percentages are 51.4%, 36.1%, and 43.9%, respectively (N=200, 69, and 18).

This graph’s main takeaway is simply the distribution of responses to “Why do you garden?” We see the primary reasons for gardening as falling under the category of self-interest or personal reasons. The top reasons were access to fresh food, enjoyment, and general interest. The three least chosen reasons were sense of community, social connections, and financial reasons. Some reasons for gardening that we did not offer as an option include educating and environmental stewardship. One survey participant said that they garden to appreciate God’s creation. Furthermore, some of the respondents emphasized access to organic, healthy, and vegan foods. Overall, it seems like many of the participants garden for usual reasons. This shows

different relationships between COVID-19 and gardening, with some people gardening in response to the effects of the pandemic. Even people who would garden anyway still have to negotiate the challenges that the pandemic presents.

The Changes of Community Gardens during the COVID-19 Pandemic

“Lost the "community" part of gardening” a respondent responded when answering how COVID-19 affected their gardening practices this year (Figure 9). Community gardens have implemented various rules and strategies according to the Madison Public Health orders to reduce transmission. For example, Old Sauk Community Garden added a hand washing area for gardeners, and did not hold group gardening. Most gardeners have also worn masks and are socially distancing while gardening. Community gardens are collectively gardened by a group of individuals and so social distance can make it hard to form a community with others. In most community gardens, work parties have been canceled or became smaller. Community gardeners have also started to plan their visitation since their community gardens can get crowded, a respondent wrote, “we went very early between 6:30 am and 7:30 am because only a very few people would be in the garden” (Figure 9). A major response we received in the survey was that shared equipment was sanitized; however, some people decided to buy their own for safety purposes, “I was more reluctant and cautious to use the shared equipment/tools” (Figure 9).

Surveying community garden supervisors and managers, they reported more people gardening this year compared to previous years and noticed an increase in applications. With the high interest and demand, some community gardens have adjusted and added more plots. River Valley Area Community Garden added 27 more plots because of the demand and even stated how they have “...almost doubled our number of gardeners going from an average of 14 to 26

families..” Unfortunately, others had to put applicants on the waitlist because of no plot availability (Figure 9).

Shortages

With increasing garden activities it has created a demand for seeds leading to seed shortages. According to survey respondents it was difficult to obtain seeds, one respondent mentioned “more people were gardening this year so plants and seeds were sold out sooner than usual.” (Figure 9) This respondent noticed the increase of gardeners this year and associated this with the seed shortages. When gardening, it can lead to an abundance of produce and so canning is usually popular among gardeners. However, canning supplies were also in demand and stores sold out. A respondent stated, “Seeds were GONE! And now, canning jars are GONE!” Not only did this respondent experience canning supply shortages, but also seed shortages (Figure 9). COVID-19 delayed production and distribution in the food industry. As more people turned to gardening for relief, the demand for seeds and canning supplies exceeded the supply.

Discussion

Although our sample is not a homogenous group, we saw general trends that have been exposed in the literature. Our study finds that respondents are tending to plant more cultivars this year than previous years because of COVID-19. This corroborates to crisis gardening trends such as in the case of Victory Gardens. Historically these gardens contributed to Americans planting a variety of edible plants and by 1944, forty percent of fresh vegetables came from victory gardens (Hermann 2015, 648). Given safety measures such as self-isolation and social distancing to reduce COVID-19 transmissions, people have started spending time outside. Our study found

that the majority of respondents were spending more time gardening this year than past years. A previous study, surveying 171 individuals also shared similar findings in that there was a higher frequency of garden usage because of COVID-19 (Corley 2020).

Modern supply chains are intricate, connecting disparate places in a relatively short time. It is difficult just to track the origins of a single manufactured item or food product, let alone describe the effects of a global pandemic on a local food supply market. Our survey results only tell us about the local and consumer ends of these supply chains, but they still reflect the large-scale perturbations mentioned in the literature. Past literature and New York Times articles showcase seed shortages at the national scale (Shanks 2020, Corkery 2020, Picchi 2020). These sources generalize local seed shortages, but our findings demonstrate that Madisonians specifically experienced seed shortages. Survey respondents did not express concern about store and restaurant closure, but they did mention grocery store supply shortages (Figure 9). Although we introduced sources that covered COVID-19 outbreaks in Wisconsin food processing plants, we had no way to connect a particular gardeners' experience with an outbreak (Soucheray 2020, 1). It is plausible that most of the shortages are due to some type of disruption unique to COVID.

Home gardening can take several forms, including indoor and outdoor cultivation, and a range of sizes, from single plants to large plots. Respondents who identified as home gardeners grew edible plants outside of their residence. The majority of respondents identified as being part of a community garden space. We emailed contacts of over 40 community gardens, which connected us with community gardeners and managers from across Dane County. The spatial extent of our survey responses are impressive given the geographical context of our study area. This helped us learn about home and community gardening throughout the area. Our results from the community garden managers showed that there was an increase in the number community

garden applications and the number of gardeners this year, thus signifying a larger interest in gardening from prior years.

We recorded a wide variety of gardening experiences. The most relevant trend in our literature review pertaining to experience was that gardening experience and participation are positively associated (Lee and Matarrita-Cascante 2019, 12). In the cited article, participation refers to acts of gardening and administration in a community organization. For instance, a nominal community garden member would not partake in as much gardening as an experienced member. Similarly, newer gardeners might not cultivate as many plants as more experienced gardeners. Growing more cultivars could be a matter of gaining experiential knowledge, confidence, or time. In any case, first-year gardeners were not as likely to grow a particular type of plant as those with more experience. This is one way gardening experience varies in our sample. Even without this variation, gardening for the first time in a pandemic must be a different experience than doing so in a stabler situation.

Fifty respondents (10.5 %) said that they gardened in a different place in 2019, all of whom must have been gardening for more than a year. A change of place and routine feels different from resuming previously established activities in a familiar environment. There are numerous variables that influence one's experience, and we only studied a few of them. The genuine interest that Madisonian gardeners showed regarding our research project attests to the importance of these experiences. There are many voices that we were not able to showcase in this project, but the ones presented here tell a story of change and adaptation, with COVID-19 undeniably playing a role in most people's gardening experiences.

Conclusion

Our aim was to explore how the COVID-19 pandemic is affecting community gardening and home gardening in and around Madison, WI. After analyzing the survey questions and short responses, we conclude that COVID-19 has impacted community gardening and home gardening. Gardening behavior and practices changed in various ways. Respondents showed an interest in gardening this year for various reasons. Some gardeners reported that COVID-19 made them grow larger gardens or plant more cultivars. Some survey respondents reported that they did not have a garden in 2019. These people most likely reacted to the circumstances of 2020 by gardening. Over half of the respondents spent more time in their gardens in 2020 than in previous years. Over half of the community garden managers who took our survey reported an increase in the number of applications in 2020 compared to previous years. Likewise, half of the community garden managers reported an increase in the number of gardeners in 2020 compared to previous years. All of these findings indicate an upward trend in gardening during COVID-19 in the Madison area.

Supply chains were disturbed, affecting the availability of fresh produce in grocery stores, thus motivating gardeners to plant their own. Gardeners had to overcome seed shortages and canning supply shortages because of compromised distribution. Luckily, most of the gardeners we surveyed reported general interest and enjoyment as their reasons for gardening. For the gardeners who were looking to improve their food access or food sovereignty, the debilitating effects of the pandemic on food supply chains made gardening a more necessary activity. Some of the gardeners were looking for social connections or a sense of community. We found that some people were disappointed by the precautions at community gardens. Social distancing diluted the interpersonal experiences of community gardens. The COVID-19

pandemic impacted the social aspect of community gardens by discouraging gardeners to engage with one another, in fear of transmission.

Most people who took our survey grow plants in a community garden or outside of their residence. More of them planted vegetables than fruits and nuts, specifically annual vegetables like leafy greens, leafy herbs, and gourds. Our findings indicate that gardeners in the Madison area are more likely to grow a particular type of edible plant if they have been gardening for longer. This relationship proved to be statistically significant with regards to perennial vegetables. This can be partially explained by the faster returns on annual plants than perennial plants. However, some of the first-year gardeners are growing edible perennials, too. In fact, there is a lot of careful planning apparent in the answers to our survey's open-ended questions. Some people see the garden as a place of opportunity, whether it be for improving physical health with exercise or for maximizing newly discovered time during the pandemic. Others struggle with the interconnectedness of COVID-19 and gardening. Community gardens have become impersonal during the pandemic and have made gardening more challenging.

Overall, COVID-19 has impacted gardening practices, behaviors, relationships, and activities in Madison, WI. Gardeners' interpersonal experiences in community gardens were unfulfilled due to health protocols such as social distancing. They displayed a wide variety of motivations, from enjoyment to issues of food accessibility, while growing a diverse set of cultivars. Gardening activity increased in 2020 as a result of COVID-19. Our results show that COVID-19 impacted home and community gardening in and around Madison, and that gardeners have been adapting to these impacts.

Acknowledgments

Thank you to Professor Gartner for his constant guidance throughout the project. We appreciate the survey respondents for taking time and completing the survey. We recognize any prospective survey respondents who gave meaningful feedback on our project. To The Gardens Network, its partners, and community garden managers for distributing surveys, thank you. We also received much help from our classmates. They gave us important feedback on our presentation and paper.

Figures

Table 1: Gardening behavior and practices of respondents.

Gardening Behavior	Response (%)	Tallies
How long have you been growing edible plants? (n=478)		
First years	11.3%	54
1-5 years	26.6%	127
6-10 years	14.2%	68
11 years or longer	47.9%	229
Where was your garden this year? (n=478)		
Outside my residence	40.0%	191
Inside my residence	8.6%	41
Community Garden	81.4%	389
At someone else's residence	1.7%	8
On vacant land	0.6%	3
In a greenhouse	0.8%	4
Other	2.3%	11
Is this the same place that you gardened in 2019? (n=476)		
Yes	76.7%	365
No	10.5%	50
I did not have a garden in 2019	12.8%	61
As a result of the COVID-19 pandemic, did you plant more varieties of cultivars this year than last year? (n=473)		
Yes	22.4%	106
No	63.6%	301
No garden in 2019	14.0%	66
As a result of the COVID-19 pandemic, did you plant a larger garden or use more of your garden space this year than last year? (n=473)		
Yes	23.3%	110
No	62.6%	296
No garden in 2019	14.2%	67
As a result of the COVID-19 pandemic, did you increase the amount of time that spent at your garden? (n=473)		
Yes	50.1%	237
No	37.0%	175
No garden in 2019	12.9%	61
Why do you garden? (n=478)		
Access to fresh food	91.2%	436
Food scarcity concerns	6.5%	31
Control how my food is produced	57.9%	277
Financial reasons	13.6%	65
General interest	71.5%	342
Enjoyment	93.5%	447
Leisure	59.6%	285
Stress relief	66.1%	316
Experience nature	68.6%	328

Exercise	53.6%	256
Social connections	34.1%	163
Sense of community	44.6%	213
Other	9.8%	47

Did you plant any of the following edible annual plants this year? (n=474)

Solanaceae/Nightshade family	96.2%	456
Root crops other than potatoes	71.5%	339
Legumes	77.2%	366
Edible grains	11.2%	53
Brassicaceae/Cruciferous plants	62.7%	297
Leafy greens	84.4%	400
Leafy herbs	82.9%	393
Cucurbitaceae/gourd family	81.9%	388
Other annual plants	17.5%	83

Did you plant any perennial vegetables this year? (n=472)

Yes	29.9%	141
No	70.1%	331

Did you plant any of the following perennial fruits and nuts this year?(n=156)

Fruiting ground covers, canes, and bushes	72.4%	113
Fruiting vines	14.7%	23
Trees with pomes	19.9%	31
Trees with drupes	16.7%	26
Bushes and/or trees that produce nuts	5.8%	9
Other perennial plants	27.6%	43

Information relevant to Figure 2, 3

Chi-squared test of independence between length of gardening experience (How long have you been growing edible plants?) and the cultivation of perennial vegetables (Did you plant any perennial vegetables this year?)

H₀: Length of gardening experience is independent of the cultivation of perennial vegetables

H_A: There is a relationship between length of gardening experience and the cultivation of perennial vegetables

α: 0.01

p-value: 0.0004

Figure 2: Contingency Table, with expected values in parentheses and chi-squared values in square brackets.

		<i>Did you plant any perennial vegetables this year?</i>		
		Yes	No	
<i>How long have you been growing edible plants?</i>	First Year	7 (16.13) [5.17]	47 (37.87) [2.20]	54
	1-5 Years	28 (37.34) [2.34]	97 (87.66) [1.00]	125
	6-10 Years	29 (20.31) [3.71]	39 (47.69) [1.58]	68
	11 Years or Longer	77 (67.21) [1.42]	148 (157.79) [0.61]	225
Total		141	331	472

Figure 3: Calculation of total chi-squared value, the sum of the chi-squared values for each response combination.

$$X^2 =$$

$$\begin{aligned} & \left(\frac{(7 - 16.13)^2}{16.13}\right) + \left(\frac{(28 - 37.34)^2}{37.34}\right) + \left(\frac{(29 - 20.31)^2}{20.31}\right) + \left(\frac{(77 - 67.21)^2}{67.21}\right) + \\ & \left(\frac{(47 - 37.87)^2}{37.87}\right) + \left(\frac{(97 - 87.66)^2}{87.66}\right) + \left(\frac{(39 - 47.69)^2}{47.69}\right) + \left(\frac{(148 - 157.79)^2}{157.79}\right) = \\ & \qquad \qquad \qquad 18.03 \end{aligned}$$

Figure 4: Percent of survey respondents by length of experience vs. cultivation of perennial fruits and nuts in 2020.

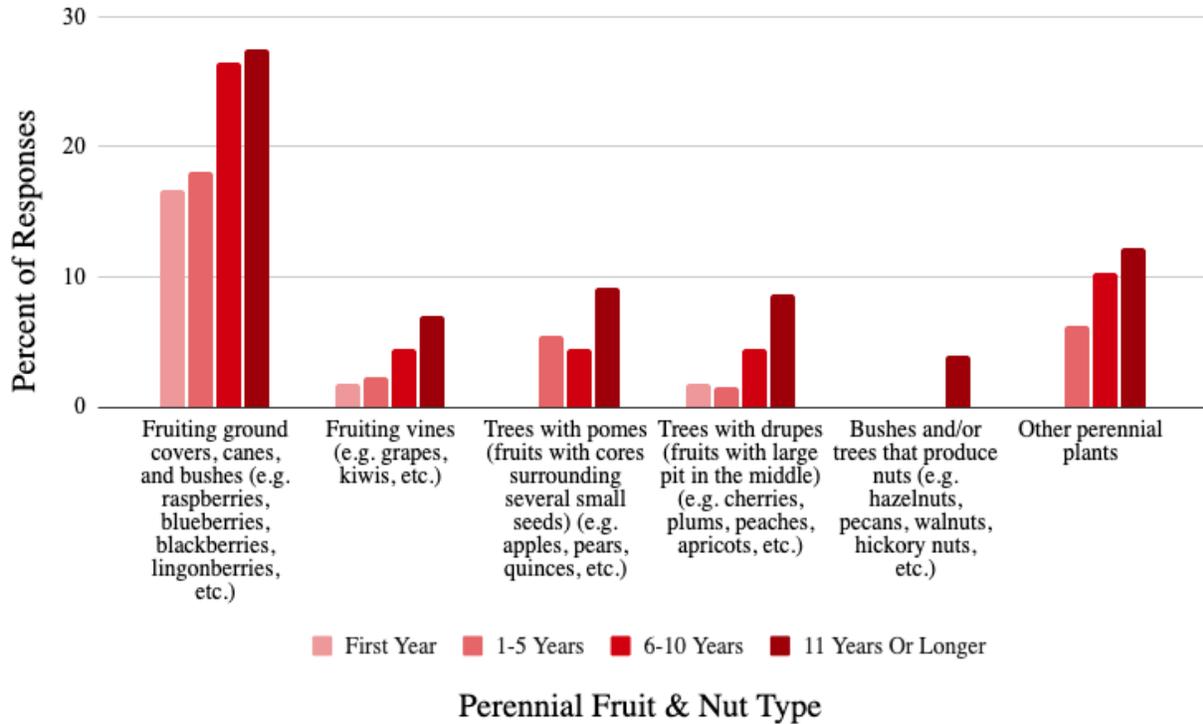


Figure 5: Percent of survey respondents by length of experience vs. cultivation of edible annual plants.

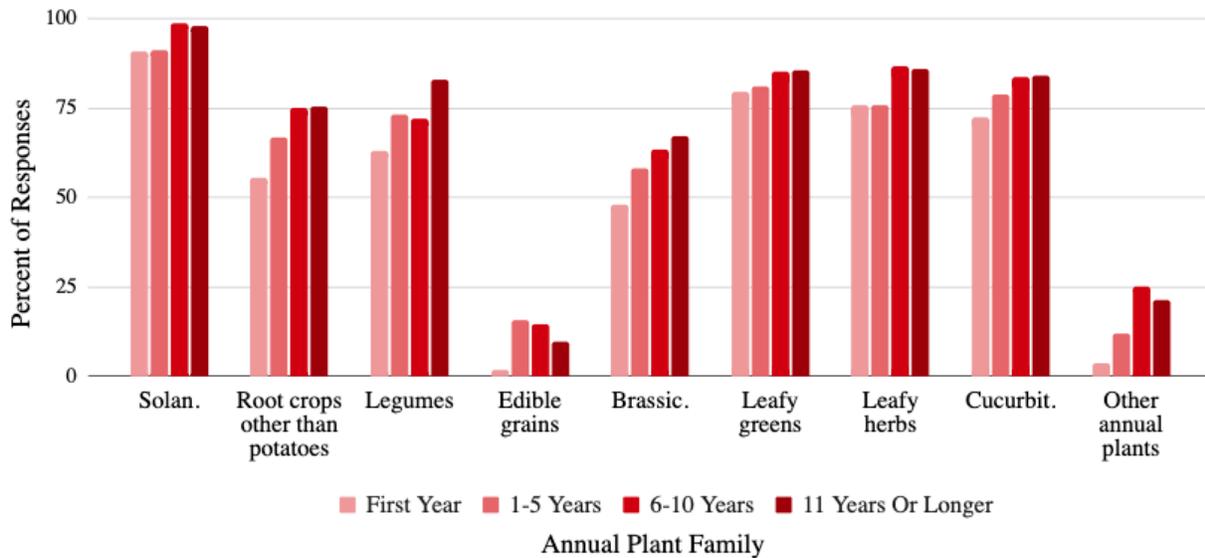


Figure 6: Percent of survey respondents by gardening location vs. reason for gardening.

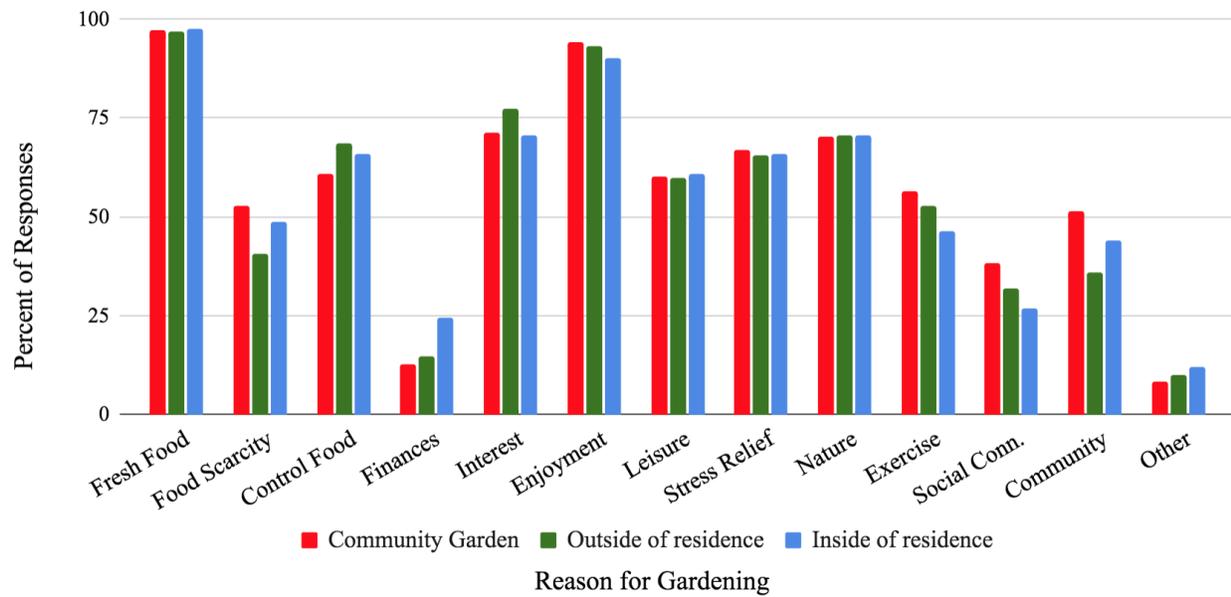


Figure 7: Community managers response to the question, How did the number of applications for this year compared to previous years? (N=41, N_{Much less}=0, N_{Less}=1, N_{The same}=12, N_{More}=23, N_{Much more}=5).

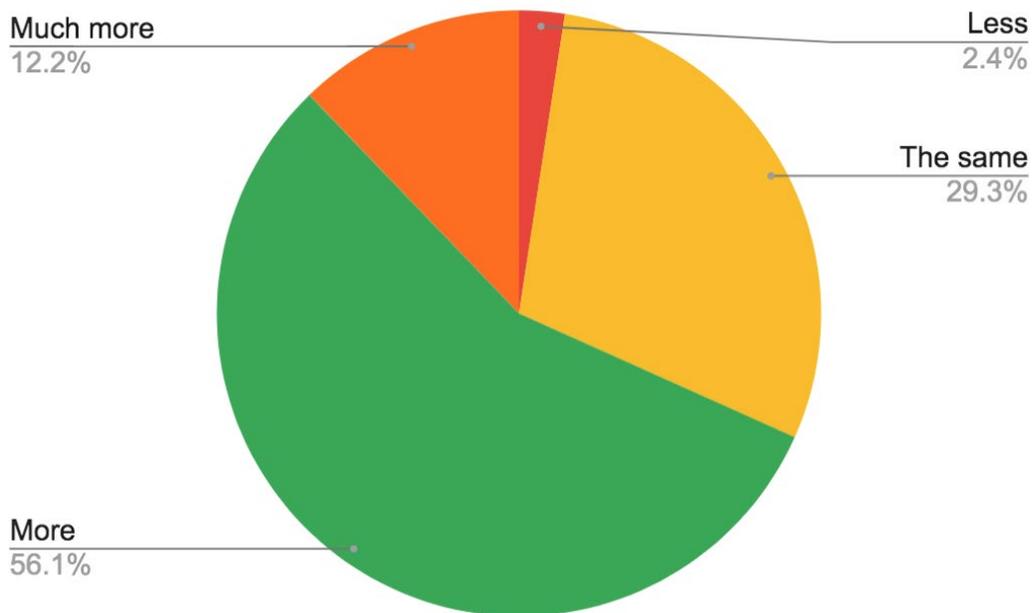


Figure 8: Community managers response to the question, How many people are gardening this year compared to previous years? (N=48, N_{Much less}=0, N_{Less}=1, N_{The same}=23, N_{More}=19, N_{Much more}=5).

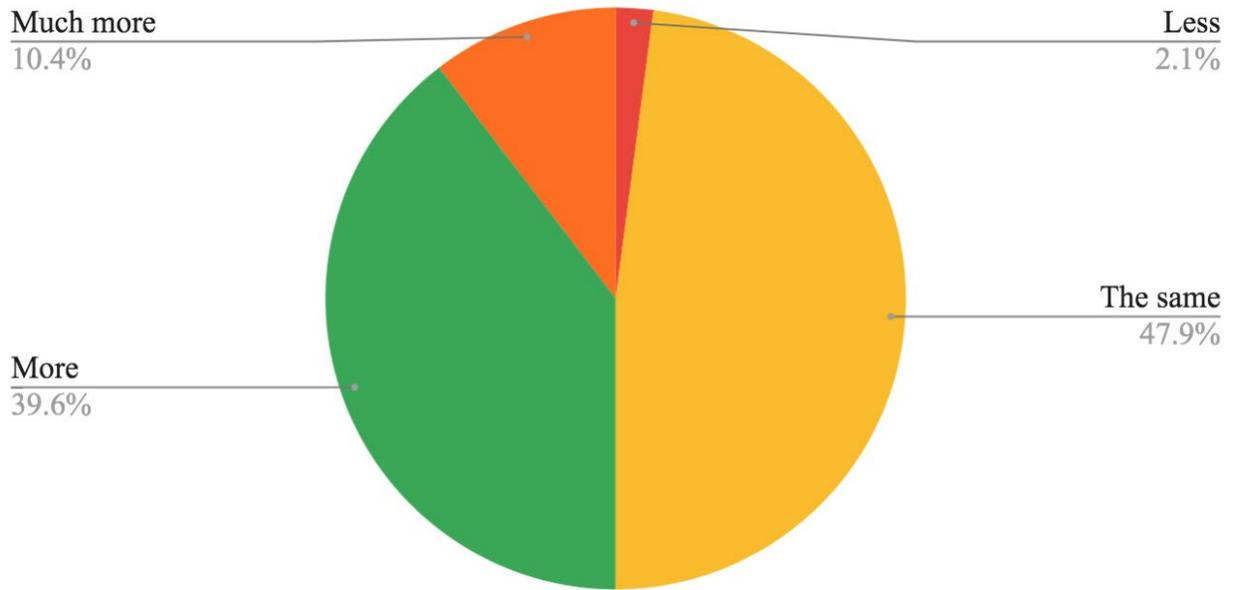
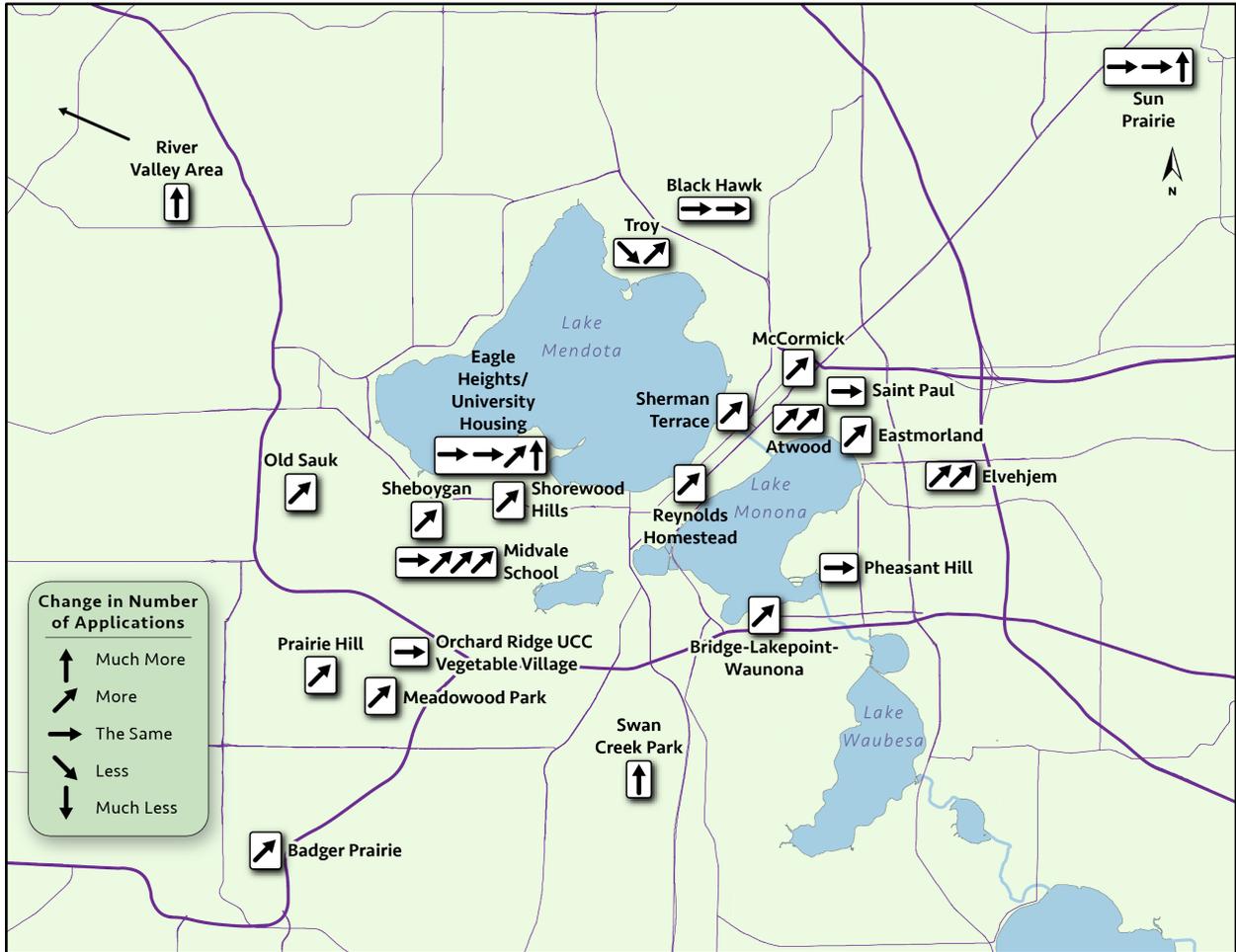


Figure 9 : Common themes and associated quotes in the surveys

Themes	Quotes
Reasons why people gardened during the pandemic	<ul style="list-style-type: none"> • "...COVID-19 partially drew me to gardening. I wasn't sure if I would be able to go to the grocery store as much and afford to buy fresh produce so I wanted to plant my own so I could have some fresh veggies and outdoor activity." • "...It was a way to get outside and appreciate that I had two gardens!" • "We also were unable to do our normal gym schedule when they were closed, so the garden was a good way to get active during the pandemic" • "... farmers market shopping was reduced pretty drastically" • "Though I did not add any perennials to the garden this year it was because I have spent the last 8 years adding them to the garden and so they are mature and producing already - I felt very secure in their production and didn't have to freak out and worry about trying to grow food because I already felt like I had a lot"
Food supply concerns	<ul style="list-style-type: none"> • "...planted more crops that could be stored (frozen, dried, root crops)," • "...tried to plant more vegetables that could be stored into the fall/winter in case there were food shortages." • "...our garden experienced more "theft" from non-members than in other years." • "...I developed methods and planned out more perennial plantings and native perennial garden space for next year."
Lack of fresh produce	<ul style="list-style-type: none"> • "I would love to see these food forests made a priority throughout human habitats, but especially in urban areas where so many people experience food insecurity even without pandemic conditions (and so many of them children). Imagine if these folks could count on supplementing the search for their next meal by foraging just about anywhere!" • ..may not be as able to get fresh food frequently at farmers markets and local stores" • "Working from home gave me more time to spend on the garden"
Changes in home and community gardens during the COVID-19 pandemic	<ul style="list-style-type: none"> • "Lost the "community" part of gardening" • "we went very early between 6:30 am and 7:30 am because only a very few people would be in the garden." • "I was more reluctant and cautious to use the shared equipment/tools." • "Working from home gave me more time during the day to attend to my veggies, so probably had better production than usual." • "...almost doubled our number of gardeners going from an average of 14 to 26 families."
Shortages in seeds and canning supplies	<ul style="list-style-type: none"> • "more people were gardening this year so plants and seeds were sold out sooner than usual." • "Seeds were GONE! And now, canning jars are GONE!"

Figure 10: Community gardens in Dane County, WI and their experience with the number of gardening applications during 2020. Each arrow represents one response.



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