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“We Have Been Part of the Response”: The Effects of COVID-19 on Community and Allotment Gardens in the Global North

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Throughout history, urban agriculture practitioners have adapted to various challenges by continuing to provide food and social benefits. Urban gardens and farms have also responded to sudden political, economic, ecological, and social crises: wartime food shortages; urban disinvestment and property abandonment; earthquakes and floods; climate-change induced weather events; and global economic disruptions. This paper examines the effects on, and responses by, urban farms and gardens to the COVID-19 pandemic. The paper is based on data collected in the summer of 2020 at the onset of the pandemic when cities were struggling with appropriate responses to curb its spread. It builds on an international research project (FEW-meter) that developed a methodology to measure material and social benefits of urban agriculture (UA) in five countries (France, Germany, Poland, UK and USA) over two growing seasons, from a Food-Energy-Water nexus perspective. We surveyed project partners to ascertain the effects of COVID-19 on those gardens and farms and we interviewed policy stakeholders in each country to investigate the wider impacts of the pandemic on UA. We report the results with respect to five key areas: (1) garden accessibility and service provision during the pandemic; (2) adjustments to operational arrangements; (3) effects on production; (4) support for urban farms and gardens through the pandemic; and (5) thoughts about the future of urban agriculture in the recovery period and beyond. The paper shows that the pandemic resulted in multiple challenges to gardens and farms including the loss of ability to provide support services, lost income, and reductions in output because of reduced labor supply. But COVID-19 also created several opportunities: new markets to sell food locally; more time available to gardeners to work in their allotments; and increased community cohesion as neighboring gardeners looked out for one another. By illustrating the range of challenges faced by the pandemic, and strategies to address challenges used by different farms and gardens, the paper illustrates how gardens in this

pandemic have adapted to become more resilient and suggests lessons for pandemic recovery and longer-term planning to enable UA to respond to future public health and other crises.

Keywords: community garden, allotment garden, COVID-19, resilience, response

INTRODUCTION

The value of urban and rural green spaces to human health and well-being has long been recognized in the literature (Rui et al., 2014; Schmutz et al., 2014; James et al., 2015; Buck, 2016; Federation of City, Farms and Community Gardens, 2016; Bragg and Leck, 2017; Barry and Blythe, 2018; Ambrose et al., 2020). The importance of access to nature in everyday life (Bell et al., 2016; Chalmin-Pui et al., 2021) became clearer during the COVID-19 pandemic, as stay-at-home and social distancing requirements led to a dramatic increase in the use of parks and gardens (Armstrong et al., 2021; RHS Lindley Library RHS Communities Team, 2021). Given the wide recognition of the value of parks and green spaces in cities (e.g., Swanwick et al., 2003; White et al., 2013; Brown et al., 2014; University of Leeds, 2015; WHO Regional Office for Europe, 2016) they have the potential to play a substantial role not only in recovery from COVID-19 but also in the resilience of communities to future environmental, health, or economic challenges (Honey-Rosés et al., 2020; Ugolini et al., 2020; Pouso et al., 2021).

This paper focuses on green spaces used for food production, specifically community gardens and allotment gardens. Urban farming and growing has taken many forms through time and space varying from quite large commercial farms to small individual plots to backyard gardens and even pots on windows or balconies. While they vary in physical and operational characteristics, and have varied goals and objectives, and benefits (Kirby et al., 2021), their common feature is that they enable individuals in cities to cultivate vegetables and fruits and are spaces in which people can engage in varied social activities.¹ The role of such spaces in the current COVID-19 crisis is investigated here.

LITERATURE REVIEW

Whilst the current paper researches, and draws lessons from, the response of urban farms and gardens to the COVID-19 pandemic, there are well-documented examples from recent history (Bell et al., 2016), of urban agriculture making an important contribution during crises as well as in post-crisis recovery. Times of conflict have been an incentive for the resurgence of gardening, for example during the First World War with food shortages appearing in the USA and Europe. The foundation of the National War Garden Commission in

1917 encouraged citizens and schools to contribute to the war effort through gardening in the USA (Herrmann, 2015) with more than 5.2 million gardens established by 1918. During the Second World War, the US National Victory Garden Program also promoted urban farming for the war effort and cultivation of patriotism, with around 20 million victory gardens by 1944 producing more than 40% of the nation's fresh vegetables. The same initiatives were in place in other nations, including the UK (Smith, 2013) and Russia (Boukharaeva and Marloie, 2015) with a similar expansion observed in urban farming.

Urban food growing is also a reaction to economic crises, both sudden and chronic. During the 1893-1897 depression, gardening was seen as an alternative to charity offerings in Detroit and relief gardens also bloomed during the Great Depression in the 1930s with more than 2.3 million US families participating in urban farming, according to a 1934 report (Lawson, 2004). In Australia and the UK, backyard home gardens and small-scale poultry raising developed during this period (Mok et al., 2014). In 1970s New York City, a fiscal crisis led to housing abandonment and demolition; the city government facilitated the creation of community gardens run by residents as a low-cost means to clear, clean and manage vacant lots. In Poland, during the economic challenges faced under Communism, allotment gardens allowed households to extend their budgets by producing vegetables and fruit for household needs (Bellows, 2004). More recent examples include Cuba's response to the economic crisis caused by the end of Soviet support and an American embargo, with a loss of 67% of incoming supplies in 1993-1994. This marked the start of the "special period" in Cuba where vacant land throughout the country's cities was cultivated to address food shortages. By 1998, Cuba had more than 8,000 urban gardens and farms, with more than 30,000 Havana residents engaged in gardening, resulting in some Havana neighborhoods producing 30% of their food through diverse garden and farm types (Novo and Murphy, 2000; Argailot, 2014). In South America, Rosario in Argentina provides a good example of civil society and local government responding to poverty by creating community gardens for hundreds of families (Santandreu et al., 2009). In Europe, increased urban farming and gardening was a response to the global financial crisis of 2008, with countries hard hit by the crisis, such as Portugal (Delgado, 2015, 2017), Greece (Partalidou and Anthopoulou, 2017) and Spain (Seguí et al., 2017) allocating vacant land to low-income households to enable them to grow food.

The COVID-19 pandemic is the latest crisis to have resulted in a resurgence of urban gardening and farming. Local food production increased in response to varied consequences of the pandemic: supermarket shortages in the early days of the pandemic (Busby, 2020; Evans and Davies, 2020; Molteno, 2020);

¹A community garden is one where the land is cared for collectively by local volunteers with shared harvest; an allotment garden is one where small parcels of land are made available for individual non-commercial gardening or growing of fruit and vegetables, and other leisure activities. Unless otherwise specified, the term "gardens" in the paper includes both forms of urban agriculture.

perceived risks to commercial food systems (Vittuari et al., 2021); free time due to furloughs and working from home (Sams, 2020); and even the desire for physical activity to address obesity, a co-morbidity for COVID-19 (BBC News, 2020).

A major motivation for engaging in urban agriculture was the potential for gardens to support health and well-being. Some embraced gardening to relieve stress and support mental health (Cockburn, 2020). Gardens have certainly proved to be beneficial to mental health during the lockdowns, relieving social isolation and improving mood and sense of community. Lades et al. (2020) found that time spent outdoors for a sample in Ireland in March 2020 was associated with markedly raised positive emotional effects and reduced negative emotions. Gardening was one of five outdoor activities associated with the greatest benefits. Bu et al. (2020) found that gardening led to improvements in mental health and well-being during the March–May lockdown period in the UK while Corley et al. (2021) and Sunga and Advincula (2021) found spending time in a garden boosted physical, emotional, and mental health. Pouso et al. (2021), using an online survey in nine countries, found that the lockdown significantly affected mental health and access to outdoor space helped people to cope with these impacts. In China, Wang et al. (2020) report on an online indoor micro-gardening programme that provided social and emotional support for participants through the pandemic.

Another important motivation for gardening and farming was the ability to grow fresh food for household use. Before COVID-19, cities were struggling to cope with increased demand from burgeoning urban populations (Khan et al., 2020), and the pandemic illustrated the fragility of supply chains and the impact of labor shortages on harvests and food processing (Lal, 2020). It reinforced the notion that urban growing with shorter supply chains for fresh produce may be able to contribute to a more resilient and sustainable domestic supply (Altieri and Nicholls, 2020; Pulighe and Lupia, 2020). To individual households, the availability of vegetables and fruits was a way to mitigate food shortages caused by consumer hoarding early in the pandemic. Growing food was also seen as assisting the increasing number of households facing food insecurity due to the economic fallout of the pandemic. Gardeners from ethnically and racially diverse communities used their growing spaces during lockdown to produce culturally appropriate foods that were limited by supply chain disruptions, while the community gardens provided common space for diverse individuals to socialize (Mejia et al., 2020).

Historically, urban agriculture has responded in varying ways to different crises because of differing socio-political situations and specific needs. This paper aims to explain how diverse urban agriculture projects in five countries adapted to the pandemic, and how in their adaptation they attempted to address the challenges of the pandemic. We report the results of surveys with two groups of stakeholders, practitioners (i.e., gardeners) and policymakers, to explain how they perceived urban gardens and farms to contribute to pandemic resilience. By illustrating the range of challenges faced by gardens due to the pandemic and strategies to address challenges used by different farms and gardens,

we suggest lessons for municipal food planning relevant to future crises.

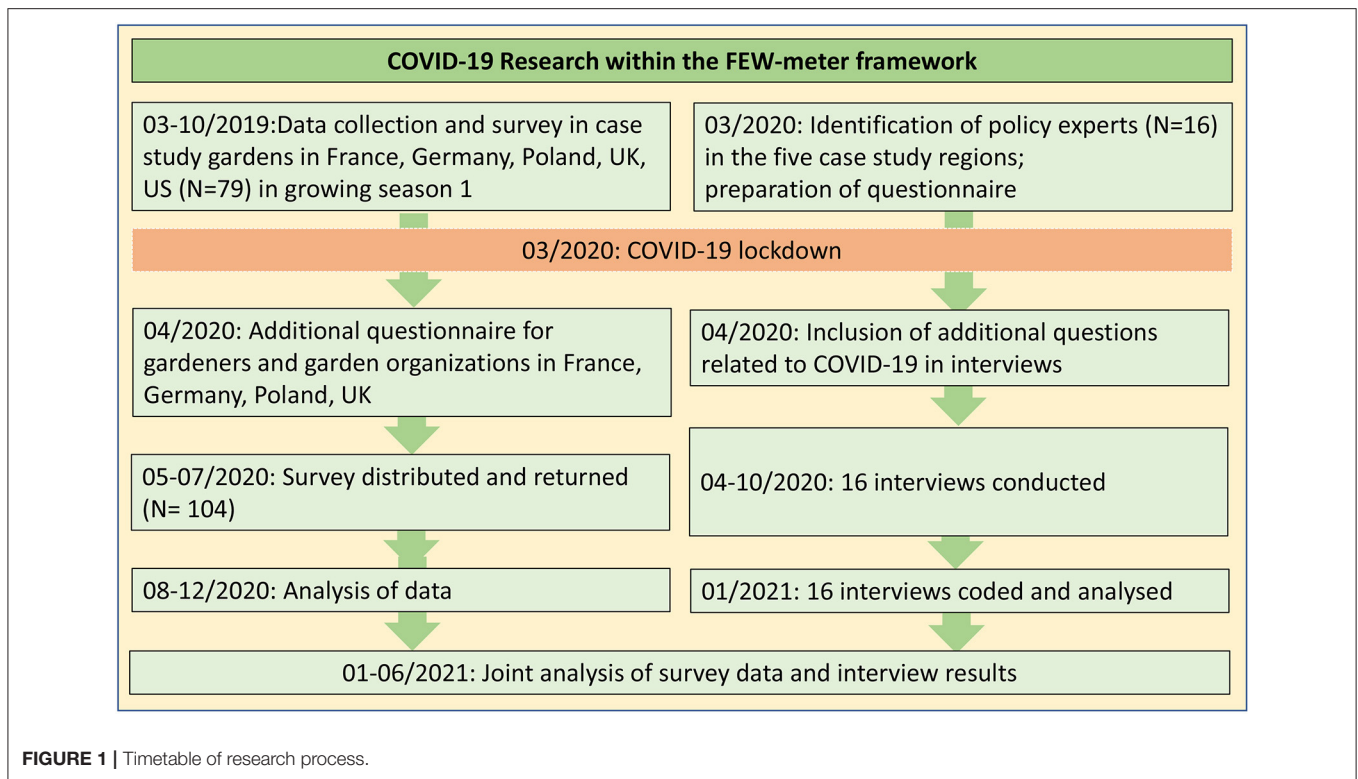
For the study, we explored the literature regarding the linkage of urban agriculture to previous crises and the contribution of urban agriculture to resilience in cities and we refer back to this in the Discussion: given the *ad hoc* nature of the fieldwork element, completed in extreme circumstances, we chose an empirical approach to explore the impact of the pandemic rather than embedding the research within a theoretical framework.

MATERIALS AND METHODS

The data informing this paper was drawn from research carried out in the summer and early autumn of 2020 in the context of a three-year international research project, called “FEW-meter,” funded under the Sustainable Urbanization Global Initiative (SUGI), a collaboration between the Joint Program Initiative (JPI) Urban Europe and the Belmont Forum. The research aims were to measure urban agriculture’s Food- Energy- and Water- (FEW) nexus and social dimensions in five countries (Poland, France, Germany, UK and the US) (Caputo et al., 2021; Kirby et al., 2021) over two growing seasons, and through analysis of this data to identify opportunities to improve the performance of urban farms and gardens. The project also included interviews with urban agriculture policy experts and other stakeholders to understand the effects of different policy environments on the success and growth of urban agriculture.

The FEW-meter project was launched in 2018 with recruitment of participating allotment gardens, community gardens and community farms. As the FEW-meter project followed a longitudinal citizen-science approach with farmers and gardeners willing to record data over two cropping periods and because not all forms of urban agriculture are equally represented in all participating countries, and much fewer have organizations that have facilitated access, it was determined early on in the project that each participating country would work with a specific type of garden: in the UK, this was to be community gardens and allotments; in France, micro-farms and allotment gardens; in Poland and Germany, allotment gardens; and in the USA, community farms. Numbers recruited to FEW-meter within each country varied: the data collection request over two growing seasons was significant, certainly for community gardens that are largely dependent on volunteer labor. This explains the low number of respondents in the UK where predominantly community gardens and allotments were the allocated urban agriculture type.

During the Spring to Fall 2019 growing season we measured operations and production and surveyed gardeners and farmers about their motivations for gardening and the effects of gardening on their well-being. The pandemic emerged by March 2020, just prior to preparation and planting of the second growing season, prompting governments in the UK, the EU, and the US to adopt social distancing, stay-at-home, and other non-pharmaceutical interventions to stop the spread of the virus. We decided to investigate the effects of COVID-19 on urban agriculture operations because we expected significant



changes that would alter farm productivity and social impacts of the gardens and farms during the second season in our study, and therefore alter the results of our analyses of the FEW nexus. The timetable explaining the timeframe of the research for this and the full FEW-meter study is given in **Figure 1**.

In Spring 2020, in each of the five countries, we added questions to the interview guides for policy stakeholders about the general effects of the COVID-19 pandemic on urban agriculture activities in their projects. To elicit information from gardeners and farmers about their experiences during the pandemic, we also surveyed those who already participated in the FEW-meter project about the impacts of COVID-19 on their individual gardening activities. The survey was adapted to community and allotment gardening and its administration was tailored to social distancing and research constraints in each of the participating countries.

Ethics approval was sought for both aspects of this research. The German team had overall responsibility for the interviews with policy stakeholders, and prior to each interview, the respondent was asked to read and sign a consent form as prepared by ILS. Consent for the garden survey was included in the initial ethics approval obtained by each country academic institution for FEW-meter as this survey was an extension of ongoing work. Where gardens were not already a part of the FEW-meter project, they were asked to read and consent to the same form that signatories to FEW-meter were asked to agree or an early section was added to the questionnaire for respondents to sign before completing the survey.

The findings from the policy interviews and garden survey are analyzed in the Results section below in tandem as the questions followed broadly the same lines of enquiry. More detail on each of the primary sources is provided below.

Guided Interviews With Policy Stakeholders

A significant part of the FEW-meter project is to investigate policies toward urban agriculture in each of the five countries, especially to review the policy enablers and barriers to upscaling of urban growing in the case study locations. The methodology for this aspect of the FEW-meter project employs qualitative interviews with key stakeholders (considered to be well-informed, influential, food policy figures) in each of the five countries, as suggested by our local academic teams. We chose diverse types of stakeholders that we considered to be relevant for the strategic development of UA.

To understand the wider impact of the COVID-19 pandemic on urban agriculture, as part of the larger 19-question interview protocol (primarily dealing with the strategic development of resource efficient UA and its embeddedness in policies) the following three questions specifically related to the effects of the COVID-19 pandemic were included:

1. How is the current crisis affecting UA in your city/region?;
2. Is any local authority supporting urban gardening/farming in light of the COVID-19 pandemic? If yes, what kind of support is provided?; and

TABLE 1 | Number of questionnaires completed by garden type in each of four FEW-meter project countries.

	Community garden representatives	Allotment association representatives	Allotment plot holders	Rationale for respondent numbers
UK	8	1	1	Questionnaire was distributed to the seven original FEW-meter case study community gardens and the one allotment association. Of these, six community gardens responded, as did the allotment association and the one plot holder within that allotment garden. In addition, the questionnaire was sent to the community garden at the University of Kent where two of the authors are employed (Schoen and Caputo) as well as one other community garden that had expressed an interest in joining FEW-meter but that did not continue to supply input and harvest data.
Germany	–	38	10	Questionnaire was distributed to allotment gardeners involved in the FEW-meter project but also, using a pre-established contact, it was possible to distribute the questionnaire to allotment association representatives of the Westphalia and Lippe Association of Allotment Gardeners (LWL). This greatly enhanced the number of German respondents.
Poland	–	–	29	Poland started the FEW-meter project with more allotment volunteers than other study countries and so had a wider base for distributing the survey.
France	2	5	10	Questionnaire was administered to the gardeners involved in the FEW-meter project and, using pre-established contacts, to the National Family Garden Federation and to 14 additional allotment garden associations.
TOTAL	10	44	50	

3. Do you believe that urban gardening/farming can increase resilience locally and city-wide in the light of this pandemic? If yes, how?

If interviewees referred to some effects of the COVID-19 pandemic in other parts of the interview, their responses were also coded accordingly and considered in the analysis. Given the exploratory nature of this research, the questions to policy stakeholders were deliberately open-ended allowing respondents to elaborate on those areas where they had knowledge and information and to provide shorter answers where they were less informed. Given the severity of the global pandemic at the time the interviews were completed, it would have been surprising if answers to other questions on the interview schedule did not allude to COVID-19. Again, due to the baseline nature of this research, we felt it added to the value of the findings if we were to report reference to the pandemic if this occurred outside of the three specific COVID-19 questions.

Three or four stakeholders were interviewed in each country, varying according to availability, leading to a total of 16 policy interviews being completed. These interviews were undertaken via online-conference tools between April and October 2020 in the five countries involved in the FEW-meter project. Interviewees included stakeholders from municipal governments (5), NGOs (7), academia (3) and one consultant. The interviews were transcribed, coded via MaxQDA (a software package for qualitative data analysis) and pseudonymized. To organize and analyse the survey data we applied the principles of qualitative content analysis (Mayring, 2000). We recognize that the completion of 16 interviews does not enable the application of our findings to a city or country level, but these results do give an indication

of the issues considered relevant and important at a very difficult time.

Survey of Gardeners and Allotment Plot Holders

The survey of allotment and community gardeners was completed with FEW-meter project gardens in France, UK, Germany and Poland, as well as additional gardens where the researchers had pre-established contacts. The urban agriculture project in New York City was farmed by cohorts of young adults, but during COVID-19, the organization running the farms delayed hiring a new cohort of farmers, so it was not possible to implement the garden survey. **Table 1** shows the number and type of respondents by garden type and country.

Numbers of questionnaires completed and type of garden respondent vary by country. This was partly due to the difficulties of engaging with garden staff and volunteers (particularly those with whom a relationship had not already been established via FEW-meter) during the pandemic but also because of the need to complete the survey in a time limited window whilst the questions regarding garden response remained relevant. The initial aim was to distribute the survey to all gardens participating in FEW-meter, but in some cases, an opportunity arose to distribute this to a wider number of relevant respondents. An explanation behind the number of questionnaire responses received by country and garden type is also given in **Table 1**.

The survey was administered in early June 2020. It asked about garden response to the pandemic at the time of completing the survey, but also asked respondents to consider conditions four months prior to the survey when the pandemic emerged



and policies to reduce its spread were initially implemented. The questionnaire investigated the impact of COVID-19 on the farms and gardens in terms of: (1) accessibility and service provision; (2) changes in operational arrangements; (3) impacts on production; and (4) future outlook. Moreover, the survey had an open-ended question that invited insights on related issues that gardeners believed to be relevant and important.

The garden survey was designed at a time when the reality of the pandemic was beginning to unfold and, this being an unprecedented event, it was difficult to know exactly what the immediate effects would be on urban growing sites and hence what the most pertinent closed questions were to ask. From our in-house knowledge as a result of working with practitioners on the FEW-meter team, we had sufficient awareness of the types of effect being experienced to put together the questionnaire but the originality of the situation in devising a survey for an unprecedented event meant that the value of the open-ended question was much greater than we had anticipated. In fact it is probably the answers received on this last point that gave the greatest insights into how the pandemic had affected the operation and perceived future of the gardens in the sample.

Questionnaire results, both closed-ended and open-ended responses, were coded and organized into key themes, reported below. Quotations are included in the results to illustrate the responses and to provide additional context. By way of illustration of the range of gardens included in our FEW-meter and specific COVID-19 research, we include a photo from each country included in the study at **Figure 2**.

RESULTS

Many insights were offered ranging from the practical effects of social distancing requirements and restrictions on gathering in the gardens to the longer-term effects of the pandemic on individual gardens. Several themes emerged relevant to these spaces over the course of the pandemic across the different groups of interviewees and across countries. These included attitudes toward local food production, the ability to operate the sites during the pandemic and future opportunities and challenges. Quotes taken from the policy interviews are followed below by brackets showing the country of the policy stakeholder. Quotes from the survey of community and allotment gardens are shown with a text reference to their origin.

Challenges and Opportunities of Food Production

One of the debates referred to in the policy interviews and survey was the role of local food production during the pandemic and implications post-COVID-19. Responses focused on the potential for locally grown food to meet increased demand, the loss of former out-of-home catering markets and discovery or expansion of alternative markets and the development of new projects.

Food Access and Demand for Local Food

In general, the interviewees agreed that the crisis has shown how fragile the food system can be and that cities are not self-sufficient in their food provision. The policy stakeholders stated that the pandemic has made people think more about food

security and food access and they stressed the importance of local food production, including urban agriculture. As one interviewee explained, “The idea of food access and food security is now at the forefront of a lot of people’s minds which I think inclusively leads to people thinking about urban farming and urban gardening and resilience of neighborhoods” (US01).

There was agreement over the generally important role of local food during the pandemic, but the policy stakeholders had different views concerning its potential contribution to food security and self-sufficiency at a wider scale. While some interviewees believed that at city level up to 75% self-sufficiency could be reached through local food supply, other stakeholders questioned the feasibility of food self-sufficiency: “You’re never gonna feed 8.5 million New Yorkers with urban farms. I think we all recognize this” (US01). A stakeholder from London explained that, while the COVID-19 crisis has highlighted how insecure people are with the food system, urban agriculture is not usually the solution that decision-makers are falling back on. Given the reference to limited space or limited markets for specialized UA production, another interviewee assumed that it would be very dangerous to suggest that urban agriculture could feed the city “unless it was suddenly established in food policy” and became “a reliable, consistent, affordable, accessible culturally specific source of food” (UK02).

Policy interviewees observed that concerns about food access in the early days of the pandemic led to a sudden increased demand for locally or self-produced food. Some peri-urban farms found themselves in a situation where they could sell a large share of their produce locally through direct sale more easily, so that they had less produce available to supply the city. One interviewee from Nantes explained that some producers even stopped supplying the city because “there was a lot of consumer demand near their farm and they did not have enough additional produce to deliver in the city” (FR03). A Polish stakeholder explained that the rising demand for food caused price increases, which created an advantage for small-scale urban farmers and gardeners who could consume their own produce: “The COVID crisis manifested itself in higher prices of fruit and vegetables. Those involved in urban farming with their own food resources [...] were not as heavily affected by this crisis as people who are not agricultural producers” (PL02).

Stakeholders shared the view that farms and gardens will increasingly gain importance as suppliers of food for their communities over the long term. One explained that demand for urban grown food will increase because, “people began to see the relationship between values and wanting their [money] to stay local, to support their local economy” (US03).

Loss of Previous Markets and Expansion of Others

Some policy interviewees reported that as a result of COVID-19, a number of farms lost their institutional markets as school meals were suspended and public canteens were closed. While some farms were unable to adjust to this challenge, others reported that sales from farmers’ markets or vegetable boxes or vegetable starts for home gardening more than made up for the revenue loss due to increased demand as consumers avoided crowded supermarkets and instead sought urban grown produce.

The pandemic also affected food distribution with a shift in demand from institutions to households and new market opportunities opening up where restaurants and onsite cafés were forced to close. Interviewees reported that the community gardens and farms were able to cope with the pandemic after some period of adjustment to new social distancing and hygiene rules. Those engaged in direct marketing for distribution were most easily able to continue their activities. As one stakeholder noted: “Our supply chains were never disrupted and so I think that our markets demonstrated that this direct consumer model is flexible and resilient” (US03).

Other gardens had to adapt their strategy and diversify their activities. One of the UK community gardens started to deliver food to local residents who were self-isolating; one stopped supplying restaurants and diverted all its produce to vegetable boxes for delivery. Community gardens in the UK as well as in the US started to run their own food banks for vulnerable or food insecure households. Others donated their produce to food banks rather than distributing directly to local residents, as this stakeholder explained: “We decided to stop selling to the public during lockdown to restrict exposure between gardeners and the public. We made an exception for donations to those in need of fresh produce, and we have been making infrequent donations as requests are made.”

Importantly, the gardeners felt that they could improve the situation during the COVID-19 lockdown and provide help to people in need. One gardener explained, “We have been part of the response, I suppose” (UK04). Although initially the pandemic did bring challenges for some community gardens as previous outlets closed, over time, opportunities opened up in terms of increased sales via home deliveries and philanthropic donations to those in most need.

Support for New Urban Agriculture Projects

In response to the crisis, cities opened up their own new funding schemes for urban agriculture. One innovative project that targeted the establishment of new food growing spaces in low-income neighborhoods was reported from the city of Nantes: “... They put in place a policy, that they called “Paysages nourriciers” [*Nourishing landscapes*] where 100 places in the conurbation [...] were transformed into food gardens, [...], often not very big, [...] to ensure a supply to the more fragile populations...” (FR03). Another practical approach was reported by a policy stakeholder from New York where the City Parks’ GreenThumb program delivered “110,000 vegetable “starts” to about 300 gardens throughout the city” to help them plant their first crops (US01).

Maintenance of Sites and Services: Challenges and Opportunities

The pandemic inevitably led to difficulties in maintaining pre-COVID-19 levels of accessibility and service, more notably for community gardens than for allotment gardens. Community gardens by their very nature bring groups of people together to work and socialize whereas allotment plots are tended individually. The stakeholder interviews and the garden survey revealed what measures were put in place to allow gardens to

continue to operate, how changes to gardener numbers affected their ability to function and what they were still able to offer in terms of services.

Measures to Allow Gardens to Continue Operations

Community gardens and allotment gardens were affected differently by COVID-19 restrictions. In the UK survey, the five community gardens that continued to operate did so with reduced numbers of gardeners to allow for social distancing. In France, at the peak of the pandemic, the two community gardens in the study had to close but by the time of completing the survey, one had partially, and the other had fully reopened.

All community gardens employed some kind of COVID-19 precaution measures during the peak of the pandemic, canceling all events, limiting numbers in the garden and strictly regulating operations. One UK garden stated that “Clean tools are provided in the morning on a table and have to be put back on another table after use. Taking any tool from the dirty table is strictly forbidden.” These precautions continued throughout the pandemic. One gardener explained that “strict measures are carried out” to allow the garden activities to continue.

The allotment garden managers in France and Germany reported that site maintenance on the individual plots continued throughout the pandemic. Plot holders were allowed into the allotment but could work only with their own tools and had to abide by national COVID-19 restrictions regarding, for example, the number of different households and total number of persons allowed on each plot at one time. Allotment gardens were often among the only (green) spaces that were left open in cities, which partly called for measures to direct the growing flow of visitors to ensure social distancing by finding “some kind of one-way street regulations [...] to regulate the crowd of visitors in some way” (GE02).

Reasons for and Effects of COVID-19 on Gardener Participation

The pandemic reduced participation in gardening as many people remained at home and avoided public spaces. Those gardeners who lived further from the garden were prevented from gardening either because of travel regulations or their own fear of public transit. In some community gardens, due to the absence of active gardeners “the ability to steward the gardens has been very limited” (US01). Transport to the gardens was a main limiting factor. One garden in the UK restricted access to those volunteers able to attend by foot, bicycle or private car. In Poland, “the low frequency of the bus made traveling difficult” for gardeners, while in France the legal limit for non-essential travel was 1 km, so for gardeners who lived more than 1 km away, the visit was impossible.

The interviews further revealed that the mix of gardeners changed during the pandemic as older gardeners tended to be more cautious and stayed home, in some cases disadvantaging younger gardeners who relied on their expertise. According to one UK respondent: “[Fewer] gardeners are coming (a) because of fear of exposure to the virus, (b) because our usual Saturday Gardening Club isn’t running. Less experienced members relied on this to learn from more experienced members.”

In contrast, some gardeners spent even more time in the garden because it was viewed as a safer outdoor space offering access to nature and physical activity. For the allotment gardens in Germany, for example, the pandemic had less of an impact on the attendance of individual plot holders. The majority reported all allotment holders were visiting as normal, albeit with social distancing measures in place. Allotment gardeners from Germany and Poland reported that even the “number of visits to the plot during the pandemic increased” and they were spending more time at the garden due to reduced work or alternative social commitments:

“Since we worked from home and had more time due to [not commuting] we spent more time in the garden than usual, especially at the beginning of the pandemic. Therefore, we also had more time to take care of the cultivation of vegetables, so we grew more vegetables. Social contacts have increased, because the other allotment gardeners were also more often in the garden and conversations over the garden fence were very possible.”

Changes in Service Offers to the Communities

Being aware that community gardens fulfill many social functions, the policy stakeholders expressed some concerns about the effects of missing support for vulnerable or isolated people who regularly would have visited community gardens. In all gardens, community and educational events had to be canceled, resulting in fewer opportunities for socializing and addressing organizational issues. The interviewees shared some concerns that it might be difficult to rebuild these lost connections to volunteers. Community gardens are often providers of a programme of social and educational activities and for the majority of gardens responding to the survey, this would normally be a major role and in some cases, a source of funds for the garden.

Another effect observed included suspended urban farm-based school nutrition education programs: “Some schools had nutrition education programs and some of those programs also included urban agricultural education and obviously that was discontinued” (US02). The challenge of reduced services in some cases opened opportunities for innovation to maintain links with the vulnerable populations that the gardens served. For example, a UK community garden started a “growing at home” group, sending seeds with garden volunteers to help them to grow vegetables at home.

Other Specific Opportunities and Challenges

Opportunities for the Environment

Respondents noted that the pandemic’s reduction in the use of garden sites had potential unrecognized benefits. One French community garden respondent noted the multiplication of flora, insects, birds and animals as a result of the reduced footfall through the garden, commenting on this as an increase in “wild gardening” visible to those who ventured out around the garden. A policy interviewee acknowledged the contribution of allotments and other gardens as key pollination sites and for the city’s water cycle: “[...] I think it [UA] can have a small but

important impact in making our cities and neighborhoods more resilient” (US01).

Opportunities for Allotments

Allotment gardens appear to have been easier to keep open during the pandemic because of the nature of the work that happens on individual plots, although for some, communal areas and facilities were closed. In contrast, according to one UK stakeholder, some of the UK allotment sites chose to close the garden to facilitate social distancing. Most allotment gardens in France, Germany and Poland remained accessible, at least for the plot-holders. During the second lockdown in France, for example, special authorization was given to all gardeners so that they could travel to their plots. Consequently, our interviewees observed that plot-holders spent much more time in the gardens than before the pandemic: “they were spending like 20 h in the gardens, they couldn’t—they didn’t want to—go home, they didn’t want to be locked in again” (PL03).

A German policy interviewee confirmed that the role of allotment gardens has been strengthened during the pandemic which has been reflected in the increased demand for allotment plots. The majority of German survey respondents also acknowledged the increased interest in gardening through the pandemic with a resultant increase in intention to grow fruit and vegetables for self-supply. Demonstrating again the perceived value of allotments at this time, one respondent from Germany wrote: “many citizens have been looking for allotments. Everyone is asking about growing fruit and vegetables. There are fewer flower beds and more vegetable beds.”

Opportunities for Policy

Interviewees observed that in the early weeks of the pandemic, local authority priorities were to secure the food supply in general. As one noted: “What we’ve seen is a huge local authority response around food provision and their priority has been feeding people and getting hold of food” (UK04).

Public authorities chose different ways to support urban agriculture, for instance, by changing land-use policies in favor of UA, reducing bureaucratic hurdles or through material or financial support. A policy stakeholder from London reported that as a result of a local conference “[the City is] opening up land for projects [...] making London more productive food-wise” (UK03). An interviewee from NYC acknowledged the administrative support by the city’s food policy director who “funded our work, ensured we could get the permits that we needed, got us equipment [...], her office was instrumental in helping us operate all of our sites. And to launch a new emergency food operation” (US03). The interviewee’s appreciation was extended to the entire municipality, which “[...] worked with us to expand our permits [...] let us take on new sites [...] closed streets for us. And these are five agencies working together who normally don’t even speak to one another to help make this out within a week’s time. So COVID has really expedited processes” (US03).

In contrast, for the allotment garden sites, interviewees did not observe any support from local authorities. They also believed that public authorities were too busy trying to tackle and survive

the pandemic: “[...] there was no support [for allotment holders] as they did not suffer any significant losses” (PL02).

Future Opportunities and Challenges

Increased Demand

The survey distributed to UK community gardens asked for views on what might happen to demand for their services once lockdown ended. At the time of the survey’s administration there was a feeling that more volunteers would want to use the garden after lockdown: many were working from home or not working and had more time to learn new skills. Many had started gardening at home and were interested in learning more about it or to practice with other people. One garden expected “Volunteering services [...] to be high in demand, especially for vulnerable groups” although another recognized the challenge of trying to meet this demand. A third stated: “I have been getting an increased number of requests to join the garden during lockdown [...] I think because people have more time on their hands, and because gardening is a peaceful and therapeutic activity.” Other opportunities included the mental health benefits of community gardening and the increased demand for mental health support post lockdown from people “[...] seeking support after the lockdown/loss of loved ones etc.”

Several respondents noted greater demand for vegetable boxes through lockdown in many community gardens across the UK and hoped the higher demand would be maintained: “We are hoping increased demand will continue, as it will be a while before customers go back to supermarkets and “normal” shopping. [...] Restaurant sales won’t be back to normal for a while.” In Germany, the majority of respondents acknowledged the increased interest in gardening through the pandemic with a resultant increase in intention to grow fruit and vegetables for self-supply. One thought that higher prices will lead to greater home harvests. One thought that 2020 might see an increase in harvests as gardeners had more time to spend in the garden and less alternative options available for leisure.

Decreased Revenues

Eight of the German allotment garden managers referred to the financial losses caused by the pandemic, largely by the closure of the allotment’s clubhouse and resulting short term loss of rental income. The community suffered as formal and informal events were canceled. It was impossible to carry out valuations on allotment plots so no exchanges could take place allowing new leases to begin. This was particularly important because many of the allotment gardeners at one garden were over 80 and hence more prone to social isolation as they were less likely to be able to visit the garden. Allotment associations in France and Germany were asked whether they thought the current crisis would have a longer-term effect on local food production. In France, one respondent thought that greater time spent on the plot will lead to better production and yet another thought that a lack of rain in 2020 combined with the difficulties of coping with the crisis will lead to reduced yields.

DISCUSSION

This section elaborates on the interview and survey results and identifies some key points that emerged through their analysis.

It is organized with the same thematic areas with which results were presented, and it aims at identifying slight divergences in the views of policy stakeholders and gardeners or key points worth highlighting. It suggests lessons learned as a result of the challenges and opportunities for local food production that COVID-19 has brought to the fore as well as the new situation facing community and allotment gardens post-pandemic. It also considers the role of local policy in assisting community and allotment gardens with a post COVID-19 recovery.

Challenges and Opportunities Regarding Food Production

There is an ongoing debate over the potential of local food to expand and increase its contribution to local self-sufficiency, the saliency of which has been reinforced as a result of the pandemic. During the World Wars, food gardens were valued for their contribution to resilience through food security. Today, the contribution of food gardens to improve resilience within the current crisis is multi-dimensional. It is also worth noting that many gardens distributed food to groups that needed it, thereby increasing food security not merely by increased production but by targeted and effective distribution. Indeed, measuring food gardens with productivity metrics may undermine their capability to endow resilience at several levels and for those who are more vulnerable.

There were commonalities between the views of policy stakeholders and those of gardeners regarding COVID-19-induced challenges and opportunities for food production and sales. One main point of divergence was that, in line with the literature (Vittuari et al., 2021), policy stakeholders in some of the case study countries focused on the importance locally produced food has gained in the pandemic and at the relevance of strengthening local markets, while gardeners' and farmers' views focused more on the direct impact the pandemic caused, pointing at changed distribution strategies or effects of the lockdown on the participation of volunteers. The latter also focused more on the gardens' important role in mental well-being and socialization. The rise in mental illnesses recorded in many nations during the pandemic (Xiong et al., 2020) shows how, during this particular crisis, mental well-being is a key factor in increasing the resilience of societies. This agrees with the literature which has described the effects of engaging in urban agriculture for mental and physical well-being (Bu et al., 2020; Lades et al., 2020; Pouso et al., 2021).

In terms of how policy has been used to ameliorate the effects of the crisis within community and allotment gardens, the responses suggest that some municipalities have been more supportive than others, with Nantes a case in point (see FR03). Other food gardens had to resort to their creativity in order to survive. For example, some were able to sell the produce typically bought by restaurants through vegetable box schemes, which have been high in demand. It may be challenging for these food gardens to retain this new customer base as the current crisis subsides. Supporting these gardens and their local supply chains with targeted policies would help build a diversified, more resilient supply system, breaking away from current long-supply chains that have proved to be vulnerable (Yu et al., 2021).

Challenges and Opportunities Regarding Maintenance of Sites and Services

Being outdoors and working in a garden has been shown to have positive mental and physical health benefits (Corley et al., 2021; Sunga and Advincula, 2021) and just at the time when these were most in need, the gardens faced challenges in being able to continue operation. Policy stakeholders gave their opinion on a more abstract level pointing at limited operability due to the general absence of volunteers in the gardens due to lockdowns and other restrictions and questioned whether the disrupted relationship with groups of volunteers could be revived post-pandemic.

According to the statements of the gardeners in terms of accessibility, many managed to remain open for large parts of the lockdown, the allotment gardens more so than community gardens. Where gardens remained open, transport issues were a barrier to access for some, often those most vulnerable because of their reliance on public transport. Those who were still able to get to a garden were appreciative of its benefits and often stayed longer as competing demands on their time had been reduced by workplace closures or opportunities to work from home.

Where allotment gardens have remained open, they have been well-attended, with a greater sense of community achieved. In line with the pulling together of communities seen in other crises, increased cooperation between plot-holders has been observed with some looking out for the plots of those unable to attend. The current crisis has also offered some community gardens the opportunity to achieve more philanthropic objectives, supplying fresh produce to food banks and delivering to those in need and those isolating.

Community gardens, by their very nature, are normally able to provide for those struggling with mental health difficulties. They offer social and educational programs that engage all sectors of society and cross the age divide. Outside of the pandemic, such gardens might be one of the few opportunities for social engagement that some gardeners experience during the week. During lockdown, where gardens remained open, they were able to continue to provide an outdoor space for people to get away from the lockdown confines of their own homes. An increased demand for allotment plots was also noted by some and an increase in the numbers wanting to visit the community gardens. This is in line with the literature in which the relationship between crises and the raised interest for engaging in urban agriculture has been explored for different periods and different regions of the world (e.g., Novo and Murphy, 2000; Delgado, 2015, 2017; Bell et al., 2016).

Where gardens were forced to close or provide a reduced service, they were absent just at the time when their normal service provision was more needed. Their educational programs ceased, which could impact childrens' relationship with the outdoors and their consumption of a healthy diet long term. Social events were also canceled, having an impact on the mental health of those who would normally attend, as well as on the finances of the gardens. As some respondents noted, having stopped all activities during 2020, it might be more difficult to get these started again post-pandemic and it will certainly be very demanding to return such events to their pre-COVID levels.

This problem is worsened by the fact that the garden leaders or managers frequently tend to be older and more experienced gardeners who have often been the most reluctant to return to the gardens due to health fears around the pandemic.

Interestingly, through the pandemic, those gardens that normally operate independently of government and grant monies have fared the worst as their commercial operations have been curtailed. Community and allotment gardens that run on-site cafes, supply to the restaurant trade, rent out space and host corporate days have all lost income whereas those that are grant dependent have sometimes fared better due to the emergence of crisis funds that some gardens have tapped into.

It is clear that the allotment gardens have been less impacted by the pandemic than the community gardens. This is largely due to their organizational structure whereby gardeners have their own individual plots and are able to tend those spaces at a distance from other gardeners. Community gardens deliberately encourage cooperation between gardeners. If social distancing requirements continue to be encouraged, gardens may need to continue to modify their operations to resume offering pre-COVID services to their established clientele.

Specific Opportunities and Challenges

Policy stakeholders agreed that the pandemic has strengthened the role of community gardens and allotment gardens. While many other outdoor spaces such as zoos, public playgrounds or even parks were closed, allotment gardens were kept open at least for the plot-holders and community gardens, especially in New York City, received strong support that expedited processes to overcome bureaucratic hurdles to ensure their operation although with limited access for volunteers. This might reflect the iconic meaning of urban agriculture in cities like New York with high levels of food insecurity. It also points to the roles these spaces have played in the view of some municipalities, particularly in the US, in supporting well-being during the pandemic.

The recognition from policy stakeholders of the contribution that urban gardening has made through the pandemic may encourage greater support for the sector post-pandemic as the contribution of urban gardens to health and nutrition becomes clearer. Looking to the future, it is likely that the role of gardens and the value of outdoor spaces in promoting mental health will become more salient as cities emerge from the pandemic with high rates of unemployment and economic dislocation, and grapple with the COVID-19 deaths that have occurred.

On the other hand, while the pandemic solidified support for gardens and farms, post-COVID-19 cities will be facing many fiscal and social challenges, and urban agriculture will be only one of many issues they will need to address. As job creation and economic development, and other strategies to reverse tax revenue losses due to reduced demand for city centre commercial real estate take priority, policies for urban agriculture may be put on the back burner.

Policy Needs to Meet Future Opportunities and Challenges

As noted, policy support to food gardens has been significant, recognizing their contribution to urban resilience in this

pandemic. Not surprisingly, those municipalities or countries that distinguished themselves over the last years for their policies promoting UA were more supportive than the others. In particular, New York and Nantes implemented practical initiatives that enabled food gardens to function when other public facilities were closed. In France, support is demonstrated not only in Nantes but also in other municipalities such as the city of Paris (Reynolds and Darly, 2018) and Romainville where the first French farm directly managed by a city was recently opened (la Cite Maraichere de Romainville, 2021). In contrast, in London and the UK generally, during the pandemic, general policy support did not translate into tangible help other than refraining from a total closure of the gardens. That said, there was substantial pandemic response financial support available from many of the grant giving trusts, both locally and nationally. Generally, the lack of policy support could be said of Germany and Poland, too. In the UK, recovery efforts are encouraged through the government's Green Recovery Challenge Fund (DEFRA, 2020) that offers grants at a minimum of £50,000 for projects that create jobs in nature recovery and conservation. The success of urban growing projects in winning such funds is as yet unclear: although some food related projects have received funding in the first round of this fund, many have not.

The post-war decades saw a decline in interest and policy support in food gardens, reflected in a reduction in the overall land area allocated to urban agriculture and in the face of their contribution to wartime resilience. In Eastern European countries this phenomenon intensified after transition to a free market economy in the 1990s, when rapid building construction began to compete with UA. One of the challenges that policy must face in a post-COVID time is the protection of a sector that in this crisis again has strengthened resilience. Financial support could attract new gardeners through reduced lease costs for allotments for those who cannot afford current allotment rent and help commercial urban gardens contain prices for vegetable boxes schemes, thus becoming competitive with big food retailers.

Limitations of the Study

For the purposes of this study, we wanted to survey the FEW-meter gardens because their involvement with the project meant that they were the most attuned to thinking about the impact of COVID-19 on their gardening and farming efforts. Ultimately the study uses a case study design rather than a random survey and so results cannot be extrapolated to all gardens and farms. Results could have been more robust and generalizable had we planned this as a separate project and surveyed a random selection of urban farmers and gardeners.

Another limitation is the selection of the participants for the interviews. We did our best to identify three to four policy stakeholders in each case study country from different spheres who were willing to be interviewed, but the sample includes a wide range of personal backgrounds that may not be comparable.

We also found the timings of lockdowns and extent of restrictions varied between nations and designing a common questionnaire that would fit all circumstances was challenging. The speed with which the pandemic advanced and social distancing restrictions became the norm in each country also

meant that findings that might have been novel in mid-2020 became less interesting as time went on.

CONCLUSION

In conclusion, the COVID-19 pandemic came as a shock to all countries in the study and many contingency plans were made as events unfolded at the national, regional and local levels. Within allotment and community gardens efforts were made to keep the sites open for as long, and for as many volunteers and gardeners, as possible, where restrictions allowed. Just as national governments did, so did urban growing spaces adapt to the changing situation. Our surveys, too, had to develop as the pandemic grew and these were adapted to the extent we could to fit the evolving circumstances in five different nations. Undertaking research in such challenging times was not without issue but the results do present important learning points for gardeners and policy makers alike. Urban community gardens at their best provide both food and, perhaps more importantly, social activities for those at various points on the mental health spectrum and just at the point when these services were required more than ever, they were forced to curtail their provision. Allotment gardens offered an important contribution to city resilience, especially during the lockdowns for those without gardens, when these spaces were often the only option for parents to find outdoor space for their children. Despite all of this, the gardens, particularly the community gardens, grew and adapted to whatever obstacles they encountered, finding alternative means to meet their regular and newly acquired objectives.

The message to policy makers at this time, drawing on lessons from the response of urban gardens to the pandemic, is that UA is a healthy and meaningful way to support post-COVID recovery as it brings together a myriad of additional benefits beyond just the production of food. Going forwards, policy needs to recognize the contribution that such spaces made to resilience during the pandemic and the contribution that they can continue to offer if financial and regulatory circumstances allow.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

VS, RF-K, and KS: conceptualization, methodology, formal analysis, investigation, data curation, writing—original draft, and review and editing. CB and SC: conceptualization,

methodology, writing—original draft, and review and editing. AF-L: investigation, data curation, and writing—original draft. NC: writing—review and editing. LP: investigation. KF: investigation and data curation. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fsufs.2021.732641/full#supplementary-material>

REFERENCES

- Altieri, M. A., and Nicholls, C. I. (2020). Agroecology and the reconstruction of a post-COVID-19 agriculture. *J. Peasant Stud.* 47, 881–898. doi: 10.1080/03066150.2020.1782891
- Ambrose, G., Das, K., Fan, Y., and Ramaswami, A. (2020). Is gardening associated with greater happiness of urban residents? A multi-activity, dynamic assessment in the Twin-Cities region, USA. *Landsc. Urban Plan.* 198:103776. doi: 10.1016/j.landurbplan.2020.103776
- Argailot, J. (2014). Émergence et impacts de l'agriculture urbaine à Cuba. *Espaces et sociétés* 158, 101–116. doi: 10.3917/esp.158.0101
- Armstrong, A., Brockett, B., Eustice, T., Lorentzon, A., O'Brien, L., and Williams, S. (2021). *Why Society Needs Nature Lessons From Research During Covid-19*. Available online at: https://www.forestresearch.gov.uk/documents/8053/Why_Society_Needs_Nature.PDF (accessed September 14, 2021).

- Barry, V., and Blythe, C. (2018). "Growing pathways to well-being through community gardens and greenspace. Case studies from Birmingham and the West Midlands, UK," in *Pathways to Well-Being in Design Examples from the Arts, Humanities and the Built Environment*, eds R. Coles, S. Costa, and S. Watson (Abingdon: Routledge), 76–96. doi: 10.4324/9781351170048-5
- BBC News (2020). *Coronavirus Doctor's Diary: How Gardening Could Help in the Fight Against Obesity*. Available online at: <https://www.bbc.co.uk/news/health-53601941> (accessed August 2, 2020).
- Bell, S., Fox-Kämper, R., Keshavarz, N., Benson, M., Caputo, S., Noori, S., et al. (2016). *Urban Allotment Gardens in Europe. 1st Edn*. London: Routledge. doi: 10.4324/9781315686608
- Bellows, A. C. (2004). One hundred years of allotment gardens in Poland. *Food Foodways* 12, 247–276. doi: 10.1080/07409710490893793
- Boukharaeva, L., and Marloie, M. (2015). *Family Urban Agriculture in Russia*. New York, NY: Springer International Publishing. doi: 10.1007/978-3-319-11614-3
- Bragg, R., and Leck, C. (2017). *Good Practice in Social Prescribing for Mental Health: The Role of Nature-Based Interventions*. New York, NY: Natural England. Available online at: <http://publications.naturalengland.org.uk/publication/5134438692814848> (accessed January 18, 2017).
- Brown, G., Schebella, M. F., and Weber, D. (2014). Using participatory GIS to measure physical activity and urban park benefits. *Landsc. Urban Plan.* 121, 34–44. doi: 10.1016/j.landurbplan.2013.09.006
- Bu, F., Stepto, A., Mak, H. W., and Fancourt, D. (2020). Time-use and mental health during the COVID-19 pandemic: a panel analysis of 55,204 adults followed across 11 weeks of lockdown in the UK. *medRxiv [Preprint]*. doi: 10.1101/2020.08.18.20177345
- Buck, D. (2016). *Gardens and Health Implications for Policy and Practice*. London: The King's Fund.
- Busby, M. (2020). How coronavirus has led to a UK boom in community food growing. *The Guardian*. Available online at: <https://www.theguardian.com/world/2020/aug/24/how-coronavirus-has-led-to-a-uk-boom-in-community-food-growing> (accessed August 24, 2020).
- Caputo, S., Schoen, V., Specht, K., Grard, B., Blythe, C., Cohen, N., et al. (2021). Applying the food-energy-water nexus approach to urban agriculture: From FEW to FEWP (Food-Energy-Water-People). *Urban For. Urban Green.* 58:126934. doi: 10.1016/j.ufug.2020.126934
- Chalmin-Pui, L. S., Roe, J., Griffiths, A., Smyth, N., Heaton, T., Clayden, A., et al. (2021). "It made me feel brighter in myself" – The health and well-being impacts of a residential front garden horticultural intervention. *Landsc. Urban Plan.* 205:103958. doi: 10.1016/j.landurbplan.2020.103958
- Cockburn, H. (2020). As gardeners turn to growing own food, research reveals dramatic decline in urban allotments over last 50 years. *The Independent*. Available at: <https://www.independent.co.uk/climate-change/news/grow-food-coronavirus-urban-allotments-fruit-vegetables-a9431051.html> (accessed March 27, 2020).
- Corley, J., Okely, J. A., Taylor, A. M., Page, D., Welstead, M., Skarabela, B., et al. (2021). Home garden use during COVID-19: associations with physical and mental wellbeing in older adults. *J. Environ. Psychol.* 73:101545. doi: 10.1016/j.jenvp.2020.101545
- DEFRA (2020). Government's £40 million Green Recovery Challenge Fund opens for applications. *Press release*. Available online at: <https://www.gov.uk/government/news/governments-40-million-green-recovery-challenge-fund-opens-for-applications> (accessed June 17, 2021).
- Delgado, C. (2015). Answer to the Portuguese crisis: turning vacant land into urban agriculture. *Cities Environ.* 8:5. Available online at: <https://digitalcommons.lmu.edu/cate/vol8/iss2/5>
- Delgado, C. (2017). Mapping urban agriculture in Portugal: lessons from practice and their relevance for European post-crisis contexts. *Moravian Geogr. Rep.* 25, 139–153. doi: 10.1515/mgr-2017-0013
- Evans, D., and Davies, J. (2020). *4 Reasons Why the World Needs More Urban Farming Post-Pandemic*. World Economic Forum Global Agenda. Available online at: <https://www.weforum.org/agenda/2020/09/urban-farming-flourish-post-pandemic/> (accessed September 01, 2020).
- Federation of City, Farms and Community Gardens (2016). *Benefits of Community Growing: Mental Health*. Bristol: FCFGC.
- Herrmann, M. M. (2015). The modern day "Victory garden." *Procedia Eng.* 118, 647–653. doi: 10.1016/j.proeng.2015.08.498
- Honey-Rosés, J., Anguelovski, I., Chireh, V. K., Daher, C., Konijnendijk van den Bosch, C., Litt, J. S., et al. (2020). The impact of COVID-19 on public space: an early review of the emerging questions – design, perceptions and inequities. *Cities Health* 1–17. doi: 10.1080/23748834.2020.1780074
- James, P., Banay, R. F., Hart, J. E., and Laden, F. (2015). A review of the health benefits of greenness. *Curr. Epidemiol. Rep.* 2, 131–142. doi: 10.1007/s40471-015-0043-7
- Khan, M. M., Akram, M. T., Janke, R., Qadri, R. W., Al-Sadi, A. M., and Farooque, A. A. (2020). Urban horticulture for food secure cities through and beyond COVID-19. *Sustainability* 12:9592. doi: 10.3390/su1229592
- Kirby, C. K., Specht, K., Fox-Kämper, R., Hawes, J. K., Cohen, N., Caputo, S., et al. (2021). Differences in motivations and social impacts across urban agriculture types: case studies in Europe and the US. *Landsc. Urban Plan.* 212:104110. doi: 10.1016/j.landurbplan.2021.104110
- la Cite Maraichere de Romainville (2021). *Cite Maraichere*. Available online at: <https://www.lacitemaraichere.com/cite-dagriculture-urbaine-et-dalimentation-solidaire-pxl-11.html> (accessed June 17, 2021).
- Lades, L. K., Laffan, K., Daly, M., and Delaney, L. (2020). Daily emotional well-being during the COVID-19 pandemic. *Br. J. Health Psychol.* 25, 902–911. doi: 10.1111/bjhp.12450
- Lal, R. (2020). Home gardening and urban agriculture for advancing food and nutritional security in response to the COVID-19 pandemic. *Food Secur.* 12, 871–876. doi: 10.1007/s12571-020-01058-3
- Lawson, L. (2004). The planner in the garden: a historical view into the relationship between planning and community gardens. *J. Plan. Hist.* 3, 151–176. doi: 10.1177/1538513204264752
- Mayring, P. (2000). Qualitative content analysis. *Forum Qual. Soc. Res.* 1. doi: 10.17169/fqs-1.2.1089
- Mejia, A., Bhattacharya, M., and Miraglia, J. (2020). Community gardening as a way to build cross-cultural community resilience in intersectionally diverse gardeners: community-based participatory research and campus-community-partnered proposal. *JMIR Res. Protoc.* 9:e21218. doi: 10.2196/21218
- Mok, H.-F., Williamson, V. G., Grove, J. R., Burry, K., Barker, S. F., and Hamilton, A. J. (2014). Strawberry fields forever? Urban agriculture in developed countries: a review. *Agron. Sustain. Dev.* 34, 21–43. doi: 10.1007/s13593-013-0156-7
- Molteno, S. (2020). How does your city grow? Lockdown illuminates urban farming and gardening's potential. Rapid Transition Alliance Story. Available online at: <https://www.rapidtransition.org/stories/how-does-your-city-grow-lockdown-illuminates-urban-farming-and-gardenings-potential/> (accessed May 14, 2020).
- Novo, M., and Murphy, C. (2000). "Urban agriculture in the city of Havana: a popular response to a crisis," in *Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda. A Reader on Urban Agriculture*, eds N. Bakker, M. Dubbeling, S. Gundel, U. Sabel-Koschella, and H. de Zeeuw (Feldafing: Deutsche Stiftung für Internationale Entwicklung (DSE), Zentralstelle für Ernährung und Landwirtschaft), 329–347.
- Partalidou, M., and Anthopoulou, T. (2017). Urban allotment gardens during precarious times: from motives to lived experiences. *Sociol. Ruralis* 57, 211–228. doi: 10.1111/soru.12117
- Pouso, S., Borja, Á., Fleming, L. E., Gómez-Baggethun, E., White, M. P., and Uyarra, M. C. (2021). Contact with blue-green spaces during the COVID-19 pandemic lockdown beneficial for mental health. *Sci. Total Environ.* 756:143984. doi: 10.1016/j.scitotenv.2020.143984
- Pulighe, G., and Lupia, F. (2020). Food first: COVID-19 outbreak and cities lockdown a booster for a wider vision on urban agriculture. *Sustainability* 12:5012. doi: 10.3390/su12125012
- Reynolds, K., and Darly, S. (2018). *Commercial Urban Agriculture in the Global City: Perspectives from New York City and Métropole du Grand Paris*. Available online at: <http://www.cunyunurbanfoodpolicy.org/news/2018/12/11/lscislvr7spj7834v9ls796n6xm7h> (accessed December 11, 2018).
- RHS Lindley Library and RHS Communities Team (2021). *Lockdown Gardening Growing Communities in the Pandemic*. Available at: <https://www.rhs.org.uk/digital-collections/lockdown-gardening> (accessed December 11, 2018).
- Rui, M., de Toffanello, E. D., Veronese, N., Zambon, S., Bolzetta, F., Sartori, L., et al. (2014). Vitamin D deficiency and leisure time activities in the elderly:

- are all pastimes the same? *PLOS ONE* 9:e94805. doi: 10.1371/journal.pone.0094805
- Sams, C. (2020). *How Covid Changed Gardening Forever*. *Index Digital*. Available online at: <https://www.indexdigital.co.uk/home-gardens/how-covid-changed-gardening-forever> (accessed November 27, 2020).
- Santandreu, A., Perazzoli, A. G., Terrile, R., Ponce, M., and Campbell, M. C. (2009). "Urban agriculture in Montevideo and Rosario: a response to crisis or a stable component of the urban landscape?" in *Urban Agriculture Magazine*, ed M. C. Campbell (Leusden: Urban Agriculture Magazine), 12–13. Available online at: <https://www.cabdirect.org/cabdirect/abstract/20093312630?start=450>
- Schmutz, U., Lennartsson, M., Williams, S., Devereaux, M., and Davies, G. (2014). *The Benefits of Gardening and Food Growing for Health and Wellbeing*. London: Garden Organic and Sustain. doi: 10.13140/RG.2.1.3703.5289
- Seguí, A. E., Mačkiewicz, B., and Rosol, M. (2017). From leisure to necessity: urban allotments in Alicante Province, Spain, in *Times of Crisis*. *ACME* 16, 276–304. Retrieved from: <https://www.acme-journal.org/index.php/acme/article/view/1402>
- Smith, D. (2013). *The Spade as mighty as the Sword; The story of World War Two's "Dig for Victory" Campaign*. London: Aurum Press Ltd.
- Sunga, A. B., and Advincola, J. L. (2021). The "plantito/plantita" home gardening during the pandemic. *Comm. Psych. Glob. Persp.* 7, 88–105. doi: 10.1285/i24212113v7i1p88
- Swanwick, C., Dunnett, N., and Woolley, H. (2003). Nature, role and value of green space in towns and cities: an overview. *Built. Environ.* (1978) 29, 94–106. doi: 10.2148/benv.29.2.94.54467
- Ugolini, F., Massetti, L., Calaza-Martínez, P., Cariñanos, P., Dobbs, C., Ostoić, S. K., et al. (2020). Effects of the COVID-19 pandemic on the use and perceptions of urban green space: an international exploratory study. *Urban For. Urban Green.* 56:126888. doi: 10.1016/j.ufug.2020.126888
- University of Leeds (2015). *A Brief Guide to the Benefits of Urban Green Spaces*. Leeds: University of Leeds.
- Vittuari, M., Bazzocchi, G., Blasioli, S., Cirone, F., Maggio, A., Orsini, F., et al. (2021). Envisioning the future of European food systems: approaches and research priorities after COVID-19. *Front. Sustain. Food Syst.* 5:58. doi: 10.3389/fsufs.2021.642787
- Wang, Y., Gao, Q., Cheng, Z., Zhang, J., and Wu, Y. (2020). Creating solace and hope during COVID-19: an innovative Internet-based social work intervention. *Int. Soc. Work* 64, 251–254. doi: 10.1177/0020872820959379
- White, M. P., Alcock, I., Wheeler, B. W., and Depledge, M. H. (2013). Would you be happier living in a greener urban area? A fixed-effects analysis of panel data. *Psychol. Sci.* 24, 920–928. doi: 10.1177/0956797612464659
- WHO Regional Office for Europe (2016). *Urban Green Spaces and Health: A Review of Evidence*. Copenhagen: WHO Regional Office for Europe.
- Xiong, J., Lipsitz, O., Nasri, F., Lui, L. M. W., Gill, H., Phan, L., et al. (2020). Impact of COVID-19 pandemic on mental health in the general population: a systematic review. *J. Affect. Disord.* 277, 55–64. doi: 10.1016/j.jad.2020.08.001
- Yu, Z., Razzaq, A., Rehman, A., Shah, A., Jameel, K., and Mor, R. S. (2021). Disruption in global supply chain and socio-economic shocks: a lesson from COVID-19 for sustainable production and consumption. *Oper. Manage. Res.* doi: 10.1007/s12063-021-00179-y

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