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CLASSIFICATION OF COMMUNITY GARDENS IN ALLEGHENY COUNTY PENNSYLVANIA

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ABSTRACT: *Community gardens provide various benefits to communities ranging from food security, increased access to fresh produce, improved health, environmental protection, and social cohesion. Postindustrial regions such as Allegheny County in Pennsylvania with a dirty industrial past, food insecurity, and poverty are re-inventing themselves as clean sustainable regions. Some of the sustainable initiatives are focused on green space development through community gardening. To understand the extent and expansion of community gardens within the county, a descriptive study was conducted to classify community gardens in Allegheny County based on year of establishment, goals, land history, and partnerships. The data were collected through online searches of municipal websites and organizations active in community gardening. Spatial community gardens' distribution maps were generated using Geographic Information Systems (GIS). Results showed that most community gardens were located within the central part of the county (where the city of Pittsburgh is located) where median incomes were low, and most residents were Supplementary Nutrition Assistance Program (SNAP) recipients. Highest community garden establishment was between 2008 and 2016 coinciding with creation of Pittsburgh Food Policy Council, Grow Pittsburgh, and Pittsburgh Adopt-A-Lot program. Gardens were established on vacant lots, old baseball fields, school property, and existing property. Flower, allotment, and school community gardens were interconnected and embedded in broad sustainability initiatives used to revitalize the region while simultaneously addressing poverty and food insecurity. Different environmental organizations and institutions that promote sustainability and green efforts established partnerships with community gardens to ensure their maintenance and success.*

Keywords: *Community gardens, sustainable cities, equity, Pittsburgh, distribution, classification*

INTRODUCTION

Community gardens, which are pieces of land gardened by a group of people in urban or rural settings either for vegetable or flower production, are used to address challenges that exist within cities and surrounding neighborhoods that include food insecurity, food deserts, poverty, crime, and distressed vacant lots (American Community Garden Association 2007; Firth, Maye, and Pearson 2011; Guitart, Pickering, and Byrne 2012; Lucke, Mamo, and Koenigstorfer 2019; Mahoney 2015; Pudup 2008). These open spaces provide many benefits to communities that include fresh food, improved emotional and physical health, community food security, environmental protection, social cohesion, and community development (American Community Garden Association 2007; Corrigan 2011; Draper and Freedman 2010; Guitart, Pickering, and Byrne 2012; Hartwig and Mason 2016; Mudu and Marini 2018; Stewart et al., 2019; Voicu and Been 2008). While research is replete with what constitues a community garden, Guitart, Pickering, and Byrne (2012) acknowledge that the definition can become fuzzy when authors assume that the term is self explanatory. For the purposes of this paper, community gardens are defined as open pieces of land that can either be managed collectively or individually by a group of people who share the same goals to produce food or flowers and can be in a rural, urban, or surbuban settings.

This collective action by different communities with shared common goals is a plus for Allegheny County Pennsylvania, where cities such as Pittsburgh have been re-inventing themselves as sustainable cities and shifting away from a dirty industrial past (Duryea 2014; Green Building Alliance n.d.; Katz and Nowak 2018; Lew 2011).

Community gardens are part of the strategies used to revitalize distressed vacant lots, establish equitable green space, and address food insecurity in the county with reinforcement from initiatives such as the Pittsburgh Climate Action Plan, the Pennsylvania Urban Agriculture Grant Program, and the Greater Pittsburgh Food Action Plan (Commonwealth of Pennsylvania 2019; Lots to Love 2021; Pittsburgh Food Policy Council 2020). These initiatives use a holistic approach that incorporates "just sustainability" to tackle systemic food insecurity and poverty for the county which is at 13.1 % and 11.7% respectively (Feeding America, 2019; United States Census Bureau, 2019). Just sustainability is a paradigm that recenters justice and equity in sustainability discourse (Agyeman 2008) thereby addressing the root of problems in food systems, which manifest themselves as symptoms in the form of poverty and food insecurity. Just sustainability paradigm stems from the definition of sustainability, a concept that advocates for change in human mindsets (Orr 2011) and recognizes 'the need to ensure a better quality of life for all, now and into the future, in a just and equitable manner' (Agyeman, Bullard, and Evans 2002, 78).

Numerous community garden studies have explored the idea of justice and equity with some demonstrating how they advance justice and equity (Burt, Mayer, and Paul 2020; Ferris, Norman, and Sempik 2001; Meenar and Hoover 2012; Pearsall et al., 2017) while others highlight that they can reinforce inequity by promoting social exclusion, capitalism, and benefitting other groups at expense of others (Horst, McClintock, and Hoey 2017; McClintock 2013; Reynolds 2015). The argument by the latter is that while community gardens promote justice through self-governing groups, promoting healthy cultural appropriate food access, and community building, they do not solve all the equity issues in communities e.g., structural racism. Because of how our society is structured aspects like structural racism, racial disparities in funding, white privilege and dominance in these spaces all work against advancing equity (McClintock 2013; Reynolds 2015). Despite these challenges, there is consensus among scholars that community gardens play an important role in promoting justice and equity. Pearsall et al (2017) study on agrobiodiversity and cultural identity in community gardens in Philadelphia revealed that different cultures selected certain plant species to grow based on their identity and justified their reason for gardening. African American gardeners focused on cleaning up, stabilizing their neighborhoods, and growing food, while Latino gardeners used the space for meetings and growing food. Asian gardeners on the other hand, used gardens as place to work with their families, share food, and socialize. The different races had freedom to choose what they wanted to grow and meet their needs as well as goals. This freedom to self-govern is part and parcel of food justice where power is distributed equitably and access to culturally appropriate healthy food is promoted (Boston University Community Service Center n.d.). Other studies have demonstrated how community building through gardening promoted food equity as well as being a vehicle of social change (Burt, Mayer, and Paul 2021; Meenar and Hoover 2012).

While community gardens to some extent uphold justice and equity, the environment is part and parcel of sustaining these gardens and its comprehensive definition is "where we live, work, play, learn, and worship as well as the physical and natural world" (Bullard n.d.). The environment as physical and natural world, and its importance as our life support-system, has been clearly explored in community garden research where garden establishment has enhanced ecosystems through increasing biodiversity (flora and fauna), storm water management, carbon sequestration, habitat creation, reducing food miles, and environmental protection (Drake and Lawson 2015; Egerer et al., 2018; Gregory, Leslie, and Drinkwater 2016; Hallett, Hoagland, and Toner 2016; Lin and Egerer 2020; Lin, Egerer, and Ossola 2018). Environmental benefits and support for ecosystems by community gardens across the globe cannot be denied but questions arise as to where they are geographically located and if they are created equal. A much more focused survey of these community gardens within specific geographic contexts then becomes crucial. This is because community garden inception, history, strategies, and goals may differ for different communities depending on the situation at hand. Numerous studies have surveyed different types of community gardens from different geographic locations or contexts to determine health outcomes, community development initiatives, multiple benefits, and challenges in management (Armstrong 2000; Drake and Lawson 2015; Lucke, Mamo, and Koenigstorfer 2019; Voicu and Been 2008; Morckel 2015; Hartwig and Mason 2016; Corrigan 2011).

Goals and objectives of the study

It is therefore upon this background that motivated this descriptive study of community gardens in Allegheny County Pennsylvania (PA), a county with a dirty environmental past associated with the steel industry which was dominant in the early 1900s to 1970s (Duryea 2014). Significant changes to the geographic context of the region occurred with the collapse of the steel industry to include population shrinkage and erosion of industrial culture (Katz and Nowak 2018; Duryea 2014). Pittsburgh, a major city in the region, started reinventing itself into an environmentally conscious and service-oriented city which has been ranked as a livable city by many (Pittsburgh Region n.d.), a significant move from its past reputation as a heavy polluted city (Duryea 2014). This environmental

consciousness from the 1990s has since been expanded over the years to include the sustainability concept as part of the county's quest to solve multiple environmental challenges with community gardens being part the strategies used (Commonwealth of Pennsylvania 2021; Hopey 2019; Lots to Love 2021; Pittsburgh Food Policy Council 2020).

This then brings up further questions as to where community gardens are located, who operates them, and what are their motivations or goals for establishment (Figure 1)? What also motivated this study was that the principal investigator, who was teaching at one of the universities in Pittsburgh, Pennsylvania, was prompted to ask similar questions based on her role as a teacher (was teaching an experiential class on urban agriculture which required students to go on field trips to selected community gardens and farms), active community gardener, and member of the Pittsburgh Food Policy Council Urban Agriculture/Immigrant Working Group. Seeking answers to these questions enhances understanding of sustainability and local context initiatives through community gardening in former industrialized regions such as Allegheny County PA. Some proponents for sustainability attest that all sustainability is local, highlighting the importance of local initiatives (Orr 2002; Orr 2011; Tapia et al., 2021). Community gardens are often shaped by their local context hence reflect political will, governance, and creativity of the participants as these spaces are often used for political action, social networking, and discussion of environmental issues to include sustainability (Drake and Lawson 2015; Mudu and Marini 2018; Stewart et al., 2019; Tapia et al., 2021). Therefore, local context and sustainability will be explored in this study, as well as addressing a gap that exists on in-depth information on community gardens in the county. While a community garden data base has been maintained by Grow Pittsburgh, a non-profit organization that supports community gardens and was established in 2005, additional information that goes beyond location of gardens is required to understand how community gardens are important in the promotion of sustainability.

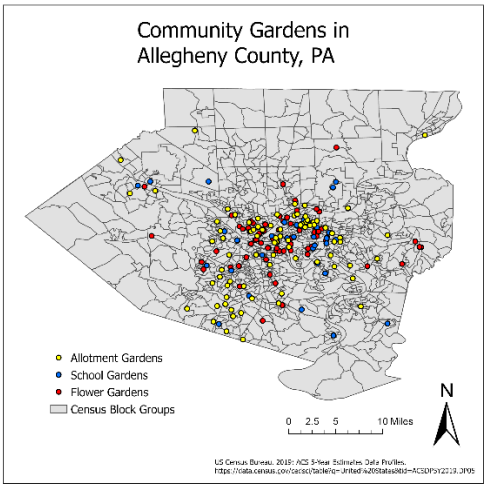

Figure 1. Spatial distribution of community gardens in Allegheny County, PA.

This study on community gardens in Allegheny County is unique in that, it is exploring a geographic region that built America with its steel industry (Buba 2018; Wilson 2013) but suffered population shrinkage after the industries collapsed in 1990 and over the past 3 decades has been trying to reinvent itself as a leader in sustainability and environment consciousness (Duryea 2014; Hopey 2019). Against that background, the region currently has 13.1 % of its population food insecure and 11.7% living in poverty (Feeding America 2019; United States Census Bureau 2019). While past studies on community gardens surveys showed spatial distribution of gardens, highlighted motivations of gardeners and participants (Armstrong 2000; Diaz et al., 2018; Gregory, Leslie, and Drinkwater 2016; Hartwig and Mason 2016; Scheromm 2015), this study explores community gardens that include flower, school, and allotment. Gardens in this case are based on common goals i.e., flower for production of flowers, school for educational purposes for children and youth, and allotment where individuals rent or adopt beds to grow food individually or collectively. Since data on some community gardens (allotment and school) are maintained by Grow Pittsburgh through voluntary sign up, the study anticipates updating the current growers' map by accounting for other gardens (i.e., flower gardens by the Western Pennsylvania Conservancy) in the county thereby giving a true picture of how many they are and where they are located. The main objectives of this study were to:

1) Determine where community gardens were located spatially in Allegheny County.
2) Determine if there were any spatial patterns in median income, Supplementary Nutrition Assistance Program (SNAP), and community garden distribution in the county.
3) Classify community gardens based on motive i.e., why they were established (purpose), site history, and affiliations. Part of this study is to gather information on partner organizations that are assisting community gardens.
4) Determine when gardens were established in the county and if they were increasing over time.

METHODS

Study area

This study was conducted in Allegheny County PA the second most populous county in the state of PA with a population of 1,216, 045 (as of July 1st, 2019), 130 municipalities and a land area of 730,08 miles^2 (United States Census Bureau 2019; Allegheny County 2020). This county is where the city of Pittsburgh is located and it grapples with food insecurity and poverty with 13.1 % of the population food insecure and 11.7% living in poverty (Feeding America, 2019; United States Census Bureau, 2019). Food insecurity is worse in children at 16.8% and affects their performance in school (Pittsburgh Food Policy Council 2020; Feeding America 2019). The problem is compounded by the fact that some of the areas are "food deserts" meaning they lack full-service grocery stores that provide communities with fresh fruits and vegetables and some of the food insecure households do not qualify for SNAP benefits (Murray 2013; Sundaram 2018; Ver Ploeg 2010). Because food deserts are prevalent in low income as well as areas where minorities are the majority, some communities have become proactive, establishing community gardens to fill in the gap of fresh produce (Culgan, Deppen, and Slaby 2018; Hughes 2017; Just Harvest 2016). However, it is important to note that food deserts reflect deeper issues in our society i.e., economic, and racial inequities that need systematic reforms to solve, so community gardens are part of a short-term solution to the issue (Ver Ploeg 2010; Wright et al. 2016)

Basic data collection on community gardens

Community gardens in this study included schools, flower, and allotment gardens. Community garden data were collected from three main websites i.e., Grow Pittsburgh's Growers Map (non-profit organization), municipalities in Allegheny County, and Western PA Conservancy. Grow Pittsburgh listed garden names, addresses, contacts, and additional information such as Facebook sites where applicable. In addition, a map showing where gardens were located was included on the website. To gather data on community gardens from the 130 municipalities in Allegheny County, each municipality website was searched for key terms "garden," and "community garden". Community garden data was often listed under "Parks and Recreation" tabs on the websites. The Google search engine was used to get data for municipalities without listed community gardens where the words "municipality + community garden" were entered. If no results were found, municipality officials and/or community leaders were contacted via email or telephone to confirm that there were any known community gardens in their municipality. Community garden data collected from the Grow Pittsburgh website as well as the different municipalities and Western PA Conservancy websites were organized and recorded in a spreadsheet under the following categories: community garden name, type, location, year established, purpose of garden, community partners, and contact information. Note that Grow Pittsburgh website had information on community gardens publicly managed by municipalities and those that were private e.g., on church property.

Insider information about some community gardens in Allegheny County

As mentioned earlier, the principal investigator was a faculty member at one of the universities in Pittsburgh and through her role as a teacher and community service knew some of the community gardens firsthand. She taught a class on urban agriculture and for three years had the opportunity to visit some of the community gardens with her students during field trips but also volunteered at some of the gardens hence knows some community dynamics from interacting with the community garden groups. She was a member of one of the community gardens and the Urban/Immigrant Agriculture Working Group of the Pittsburgh Food Policy Council (PFPC)- a key organization that is involved in urban agriculture in the county. This working group had monthly meetings and had members who were involved in advocating for land security and access in community gardening in Pittsburgh. In addition, the city hosted an Urban Agriculture tour facilitated by the PFPC in the summer of 2017, 2018, and 2019 in which some of the authors

participated in and hence were able to have some ground truth data on some of the gardens. We are highlighting this information to show that there was some ground truthing on some of the community gardens through teaching and service to the community.

Community garden mapping

Maps showing spatial distribution of community gardens in Allegheny County were created using Geographic Information Systems (GIS). Data on community gardens' location based on their addresses were used to create spatial maps showing spatial distribution of gardens across the county using ArcGIS. Because the researchers also had questions on spatial patterns between community garden distribution with income and SNAP distribution, spatial analyses were carried out where geocoded community gardens data were overlaid over median income and SNAP data for the county and maps created using ArcGIS. These maps display data in Allegheny County, PA at the census block group level. The background layer and socioeconomic data shown in these maps (Figure 2 and 3) come from the US Census Bureau's 2019 5-year American Community Survey and these data were instrumental in mapping indicators of food insecurity (SNAP distribution) and poverty (median household income). These data were joined to their corresponding block groups, before being converted into a raster. Community gardens were then plotted as graduated circles (larger circles representing more gardens in an area) from data collected on community gardens. Finally, areas of interest (high SNAP presence/ low median income) were identified and displayed in zoomed-in boxes. Apart from providing baseline data on garden location, the website provided information on community garden partners (and their roles), site history, and garden purpose or motivation.

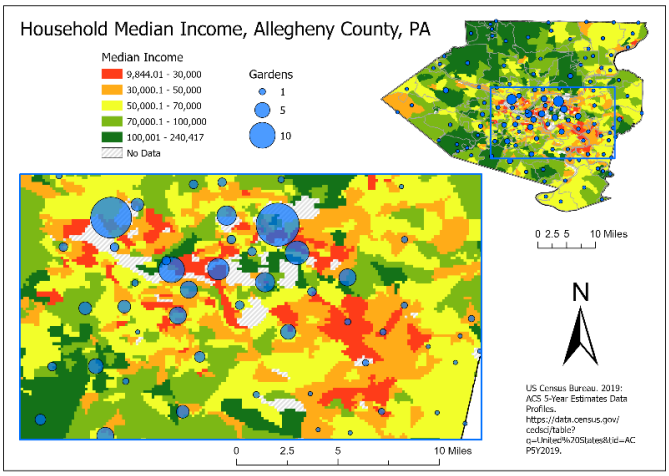

Figure 2. Household median income and community garden distribution in Allegheny County, PA.

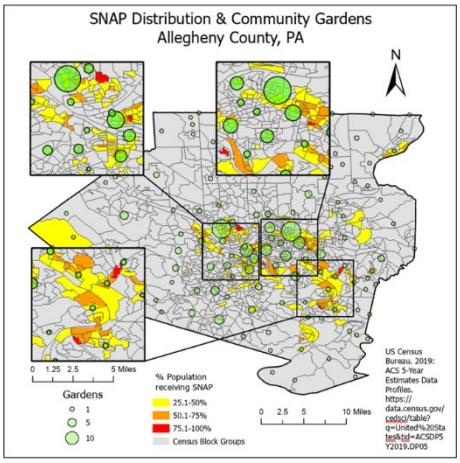

Figure 3. Community gardens and SNAP distribution in Allegheny County, PA

RESULTS

There were approximately 230 (103 allotment, 87 flower, and 40 school gardens) community gardens in Allegheny County, PA as of December 2019 (Figure 1). Allotment gardens made up about 45% of total community gardens, followed by flower gardens at 38% and school gardens at 17%. Flower gardens in the study were those only established by the Western Pennsylvania Conservancy (WPC) of which about 62% are in Allegheny County. Most of the community gardens were clustered in the center of the county where the city of Pittsburgh is (Figure 1) as well as southwest in the South Hills area. In the South Hills area, allotment gardens dominate as compared to a few school gardens. A small cluster of gardens existed in the northwest part of the county with only a few allotment and school gardens and one flower garden. Around the city of Pittsburgh where there was the highest concentration of community gardens, the school, allotment, and flower gardens were in very close proximity with each other. This is also the area where median incomes are low i.e., between $9,844.01 to $30,000 (Figure 2).

As far as community garden and SNAP spatial distribution is concerned, the maps showed that some central parts of the county with high garden concentration were also areas with high percentage of SNAP recipients (Figure 3). However, the southern, northeast, and western part of the county had 25.1-100 % of the population receiving SNAP

but no community gardens. The western tip of the state was devoid of community gardens although between 25.1-50% of its population receive SNAP benefits. The southwestern part with a few clusters of 25.1-50% of its population receiving SNAP benefits had a lot more gardens (Figure 3).

Generally, community gardens increased in their establishment from the 1970s to 2019 with 55% of gardens established between 2000 and 2019, while 36%, 7%, and 2% were established in 1990s, 1980s, and 1970s respectively. Note that this data are for current community gardens and does not take account for gardens lost or replaced or those inactive. While the community gardens increased in numbers over the years, results also show that motivations for the garden establishment ranged from consumption, food pantry, education, community development, sustainability, and neighborhood beautification. Neighborhood beautification was mainly emphasized in the flower gardens in which Western PA Conservancy focuses on in addition to strengthening communities. It has established 130 community flower gardens in Western PA and has worked with 11,000 volunteers with some of them acting as stewards to maintain these gardens. Its impacts have gone beyond Allegheny County. Allotment garden data showed that 38% motivation was food consumption, 23% community building, 17% food pantry, 12% education, and 10 % sustainability (Figure 4). School gardens on the other hand focused on providing food for their students (73%) and less on Science Technology, Engineering and Mathematics (STEM) education.

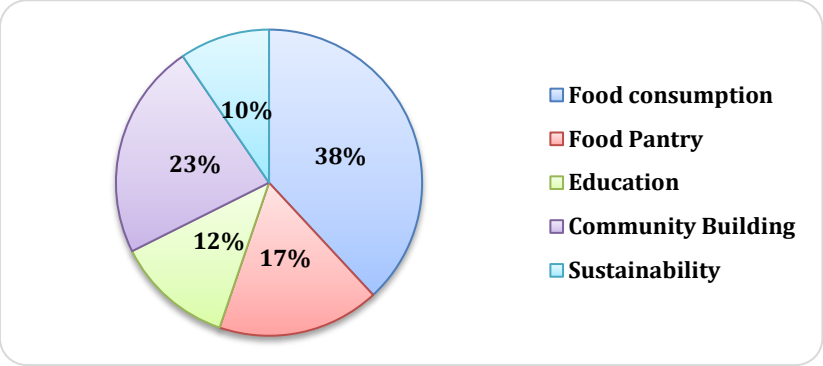

Figure 4: Motivations for allotment gardens establishment.

Apart from motivations, the study also gathered data on community garden site history. Results from 56 allotment gardens showed that 43% of gardens were established on vacant lots, 38% on existing property (existing property refers to land owned by churches, neighborhood organizations, and senior living facilities where they have enough land to have a community garden), 13% on old baseball fields, and 7% on apartment complexes premises. Figures 5, 6, and 7 show pictures of allotment gardens often visited by the principal investigator during class field trips and volunteer days which were established on existing property (church), vacant lot, and old baseball field, respectively.

Figure 5: Allotment garden on existing property (church) (Chitiyo 2018).

Figure 6: Allotment garden on a vacant lot (Chitiyo 2017).

Figure 7: Allotment garden on an old baseball field (Chitiyo 2018).

All the school gardens were established on school property with 9% on Pre-K, 30% on kindergarten, 35% on elementary, 19% on middle school, and 7% on high school property. Flower gardens sites ranged from public premises such as libraries to roadsides, city of Pittsburgh property, and within sections of neighborhoods. Establishment and maintenance of community gardens is without support from local organizations. There were several organizations in the county (with most located within the city of Pittsburgh), that supported community garden establishment, maintenance, and expansion. Some of them focused on sustainable agriculture, urban agriculture, and food security. These organizations include Grow Pittsburgh, Just Harvest, South Hills Interfaith Movement, Sustainable Pittsburgh, Phipps Conservatory, Western PA Conservancy, and 412 Food Rescue among others. Their roles are summarized in Table 1.

Table 1. Selected organizations that work with community gardens in Allegheny County.

Organizations	**Role in community gardens**
Grow Pittsburgh, Phipps Conservatory	Rent tools, training, technical expertise& training, garden start up grants, outreach
Allegheny County Conservation District	Soil tests (including lead)
Pennsylvania State University Extension	Technical expertise, master gardener training
Pittsburgh Food Policy Council	Policy, networks, support, outreach
Western PA Conservancy	Establishing flower gardens, community support
Grounded Strategies	Technical support, green space development, neighborhood beautification projects
City of Pittsburgh, Three Rivers Agricultural Land Initiative (TRALI), Urban Redevelopment Authority, Allegheny Land Trust	Land access, security
Sustainable Pittsburgh	Land use, racial equity, workforce development, sustainability
South Hills Interfaith Movement (SHIM)	Resource support, technical expertise, training
Love your block (Pittsburgh Mayor's office), Three Rivers Community Foundation, Sprout Fund, Buhl foundation, Awesome Pittsburgh, Chamber of Commerce, Development Corporations	Funding for garden projects in the form of grants, crowd funding, and private businesses.

Results from field trips (which had a service component that involved helping community gardens with tasks) and participating in garden volunteer days also showed how different community gardens helped each other with technical expertise as well as validating the role of organizations in Table 1 in active support of community garden establishment and success by providing financial resources, training, facilitating long term land access etc. A total of 10 allotment, 3 school, and 2 flower gardens were visited. They were repeated visits through field trips, volunteer days to 6 allotment gardens and one school garden. See summary of information below:

Table 2. Community gardens visited by researchers.

Garden type	**Number**	**Land type**
Allotment	10	30 % on vacant lots; 30% on old baseball fields; 40% existing property (church property)
School	3	School property
Flower	2	Public library premises

DISCUSSION

Over 230 community gardens exist in Allegheny County, with 55% established after the year 2000. Since this study focused on current gardens and it did not take into account those that were replaced or discontinued, it is possible that there could be more gardens. The increase in current gardens after year 2000, can be attributed to proliferation of key environmentally conscious organizations (beyond year 2000) such as Grow Pittsburgh, Phipps Conservatory, and Pittsburgh Food Policy Council--fierce proponents of neighborhood revitalization, self-sufficiency, and sustainability using urban agriculture as a tool (Grow Pittsburgh n.d.; Murray 2013; Phipps Conservatory 2021;

Pittsburgh Food Policy Council 2020). Some of the organizations such as the Western PA Conservancy were established as early as 1932 and have solidified their operation in the state (Open Space Plan 2013). Most of the community gardens are concentrated in the central part of the county where the city of Pittsburgh is (Figure 1) which is where most of the environmental organization are concentrated as well. Not only are community gardens concentrated around the city of Pittsburgh, but all the three types of community gardens are in close proximity with each other (Figure 1). This could be due to the fact that efforts of reinventing the region from a dirty industrial past involve holistic approach to revitalize distressed vacant lots and create equitable green space which are embedded in broader initiatives such as the Pittsburgh Climate Action Plan, adoption of United Nations Sustainable Development Goals, the Pennsylvania Urban Agriculture Grant Program, and the Greater Pittsburgh Food Action Plan, making the city a hub for sustainability efforts (Commonwealth of Pennsylvania 2019; Duryea 2014; Green Building Alliance n.d.; Hopey 2019; Katz and Nowak 2018; Lew 2011; Lots to Love 2021; Pittsburgh Food Policy Council 2020).

The county is grappling with multiple challenges that are interconnected hence the solutions need be connected as well. Allotment, school, and flower gardens have common goals of environmental protection and enhancing the landscape. They provide various benefits to communities that include fresh food, improved emotional and physical health, community food security, environmental protection, social cohesion, and community development (American Community Garden Association 2007; Corrigan 2011; Draper and Freedman 2010; Guitart, Pickering, and Byrne 2012; Hartwig and Mason 2016; Mudu and Marini 2018; Stewart et al., 2019; Voicu and Been 2008). This holistic approach is vital for the county to address its challenges which include 11.7% of its population living in poverty and 13.1% food insecure (United States Census Bureau 2019; Allegheny County 2020). Results from the study showed that approximately 55% (food consumption and food pantry) (Figure 4) of allotment garden establishment was motivated around food provision, with 16.3 % supplying food pantries (distribution centers that feed hungry families), an indicator that some families do not have enough food implying food insecurity might be a challenge in some communities within the county. This might be the reason why 73% of school community gardens distribute garden produce to their students. On the other hand, the food consumption could be linked to the community wanting to have autonomy on what they eat and not necessarily linked to food insecurity (Hume, Summers, and Cagnaro 2021). Nevertheless, 55% of allotment community gardening devoted to food provisioning could be an indicator of communities that are promoting food self-sufficiency. Apart from food provisioning, other motivations include community development, sustainability, and education, which reflect the key motivations and focus of allotment gardens within the local context.

This idea of local context is also reflected in the holistic approach that promotes equity. It facilitates partnerships of different stakeholders with the community gardens (Table 1). The stakeholders facilitate education, training, urban agriculture policy, access to land, tools, and financial resources which are key to successful establishment and maintenance of community gardens (Gregory, Leslie, and Drinkwater 2016). Financial resources in Allegheny County are available through grants and crowd funding where local government, foundations, businesses, and individuals come together to support community gardens (Table 1) (Danko et al. 2015). These forms of support are important since most of the community gardens are in low-income areas (Figure 2), where a significant part of the population is receiving SNAP benefits (Figure 3). Observations and interactions with some community gardens as well as insider information from Urban Agriculture Working Group monthly meetings (Table 2) revealed and confirmed collective action by some of the organizations listed in Table 1. Grow Pittsburgh worked closely with Pennsylvania State Extension and Allegheny County soil conservation district on training gardeners, providing technical expertise, soil testing, and providing grants. In addition, Grow Pittsburgh, Phipps Conservatory Allegheny County Conservation District, Pennsylvania State University Extension, Grounded Strategies, City of Pittsburgh (department of city planning), Three Rivers Agricultural Land Initiative (TRALI), Urban Redevelopment Authority, Allegheny Land Trust, and South Hills Interfaith Movement (SHIM) were all members of the Urban Agriculture Working Group hence worked together to enhance establishment and success of community gardens. This collective action where different stakeholders (Table 1) that include non-profit organizations, religious organizations, federal government, and municipalities are working together with low-income communities to address challenges at hand is what Agyeman 2008 referred to as "just sustainability." Through these efforts, the stakeholders were promoting equity. Insider information helped to confirm the deeper role of the stakeholders in promoting "just sustainability." This not only helped in answering the research question on garden affiliations but illuminated the nature of affiliations. Just sustainability ensures improvement of people's quality of life and well-being where their needs are met within the limits of current ecosystems (Agyeman 2012). Embedded within this concept of just sustainability is the idea of the impact of local efforts and governance which is unique to different settings, including Allegheny County. Key people impacted by issues participate in solutions e.g., Western PA Conservancy has worked with over 11,000

volunteers in the western Pennsylvania (including Allegheny County) in its neighborhood beautification programs, creating local environmental stewards in the process since 1932 (Open Space Plan 2013; Western Pennsylvania Conservancy 2021).

These collective efforts at a local level, go a long way in not only enabling residents to supplement their food through community gardening but saves both residents and city money. The city of Pittsburgh spends approximately $595 to maintain a single vacant lot per year (Algert, Baameur, and Renvall 2014; Open Space Plan 2013). Results from the study revealed that some of the community gardens were established on former vacant lots as well as old baseball fields. According to ground truth data gathered by authors through field visits, meetings, and volunteer days, all the old baseball fields (Table 2 and Figure 7) had become sites for crime. The situation changed when they were converted to community gardens. One of the former distressed vacant lots visited by authors, generated interest from developers after being converted to a community garden. This supports past research that has demonstrated that distressed vacant lots and former baseball fields (which are tied to the history of collapse of the steel industry) are repurposed which results in enhanced aesthetics and increase in property values (Open Space Plan, 2013; Voicu and Been 2008). Approximately 114 city owned vacant lots (10 acres) have been converted to valuable green space through the Pittsburgh City Adopt-A-Lot Program, which offers 3-year renewable leases for communities to grow food and flowers (Danko et al., 2015; Open Space 2013; Waltz 2021). This is part of efforts to increase land access and security in addition to repurposing the land. Other efforts include permanent purchase and protection of urban agricultural land for community gardening and farms by TRALI, Grow Pittsburgh, and Allegheny Land Trust coalition targeting low-income areas where land is at high risk of being taken away for commercial development (Waltz 2021).

CONCLUSION

Community gardens are key in addressing challenges that exist within cities and surrounding neighborhoods that include food insecurity, poverty, crime, and distressed vacant lots. Our study was able to achieve most of its objectives which included determining spatial location of three types of community gardens i.e., flower, school, and allotment in Allegheny County. It demonstrated that community gardens were increasing over time with most established after year 2000, which coincides with creation of key urban agriculture organizations such as the Pittsburgh Food Policy Council and Grow Pittsburgh. Data collected in the study also showed that some allotment gardens were on former vacant lots and old baseball fields and the main motivation for participants was food provision. Mapping these gardens revealed spatial patterns between SNAP, median income, and community garden distribution where community gardens were concentrated in located in low-income areas where residents were also SNAP recipients, a possible indicator of their role in alleviating food insecurity. In addition, not only were community gardens concentrated in low-income areas but also around the city of Pittsburgh where most of the federal agencies, nonprofit organizations, private businesses, and extension offices active in sustainability were located. These organizations were affiliated with community gardens and work across scales in the county to provide them with necessary support through collective action such as technical training, garden tool rental, garden start up grants, soil testing, master gardener training etc (Table 1). Since the city of Pittsburgh is reinventing itself as a sustainable city, community garden establishment is also being shaped by local sustainability initiatives such as Pittsburgh Climate Action Plan, United Nations Sustainable Development Goals adoption, the Pennsylvania Urban Agriculture Grant Program, and the Greater Pittsburgh Food Action Plan, thereby changing the narrative of its historical dirty industrial past associated the steel industry.

The above positive achievements from the study are a good start, however, there were several limitations. While we were able to compile a list of community gardens and show their location spatially on a map, we may have left some which do not have an online presence or those not registered with their municipality, Grow Pittsburgh, or Western Pennsylvania Conservancy. This means that results from our study were skewed to those only captured and hence we may not have represented all the community gardens in the county. In addition, despite some of the authors having insider information on some gardens and did ground truthing on some of them through field trips, urban agriculture tours, and workday volunteer activities, some gardens not connected to urban agriculture network may have been left out. Our focus on current community gardens left out information on rate of replacement i.e., how many gardens were established and lost over a period of time. Due to limited capacity, study time frame, and how extensive the county is we were not able to collect meaningful comprehensive data on who was operating these community gardens and why, hence could not perform any further analysis.

Future directions include a follow up with other organizations involved in community gardens e.g., the Penn State Extension to get additional information on community garden data in the county through its master gardener program. Since the Penn State Extension master gardener program was established in 1982, and currently has 3, 500 master gardeners volunteering to local communities through gardening, they may have historical data on community garden establishment including some that have been lost over time (Penn State Extension n.d.). Their volunteers may know community gardens that may not have an online presence through their networks which include working with both youths and adults. Getting additional data will fill in the gaps in this study and help us to better understand rate of replacement of community gardens in the county and provide an up-to date baseline data for other researchers. Since rate of replacement data includes information on gardens being established and being lost, it will also shed light on the causes of garden loss if it is through land tenure loss, gentrification, water access, lack of continuous resources for garden upkeep, time commitment, and lack of viable stakeholder connections across scales as highlighted by past research (Diaz et al. 2018; Drake and Lawson 2015; Gregory et al. 2016; McClintock 2015; Reynolds 2015). This information together with a follow up survey to find out who operates these gardens and why as well as what is being grown in what quantities will help effectively inform policy makers. It will also provide opportunities for community garden expansion and tackle broad issues such as climate change. The path that Allegheny County is taking is applicable to other regions of the world that are trying to revitalize their communities and promote sustainability.

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