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# Attitudes and Perceptions of Community Gardens: Making a Place for Them in Our Neighborhoods

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**Abstract:** Although community gardens provide numerous economic, environmental, and social benefits, some have been lost to other land uses due to the lack of organized and effective public support. Knowledge about people's attitudes and perceptions towards these landscapes is important to achieve greater public support. This study used a scene rating survey to investigate attitudes and perceptions of four different groups (community gardeners, community and home gardeners, home gardeners, and non-gardeners) in Roanoke, Virginia. Content analysis, factor analysis, descriptive statistics, customized Kruskal- Wallis test (ANOVA) and content identifying method (CIM) procedures were used. All statistical analyses were completed at a 95% significance level using SPSS version 21. Results showed that there are seven dimensions important to participants' preferences in community gardens including "Gathering and Seating", "Plots with Boundaries", "Focal Points", "Plots without Boundaries", Garden Entrance", Untidy Space", and "Composting Structures". Excluding the "Gathering and Seating" dimension, a significant difference was detected between participant groups. Based on these dimensions, this study provides design recommendations for community garden projects to minimize possible opposition between gardeners and non-gardeners and to develop more successful community garden programs for the long-term survival of these landscapes in cities.

**Keywords:** landscape preference; community garden design; environmental perception; urban agriculture; landscape architecture



**Citation:** Kordon, S.; Miller, P.A.; Bohannon, C.L. Attitudes and Perceptions of Community Gardens: Making a Place for Them in Our Neighborhoods. *Land* **2022**, *11*, 1762. https://doi.org/10.3390/land11101762

Academic Editors: Maciej Lasocki, José Guadalupe Vargas Hernández, Martina Koll-Schretzenmayr and Justyna Zdunek-Wielgołaska

Received: 4 September 2022
Accepted: 29 September 2022
Published: 11 October 2022



## 1. Introduction

The industrialized modern agriculture system has resulted in ecological, economic, and social imbalances such as extensive use of environmental resources, uneven income opportunities between farmers, and unjust living and working conditions for workers [1]. In response to these compounding impacts, community-based food projects such as community gardens have gained attention and become popular in cities. There are different types of community gardening practices depending on the intended purpose and targeted population including neighborhood gardens, school gardens, therapeutic gardens, etc. [2]. A more detailed classification of community gardens is provided by Kordon [3]. This research only focuses on neighborhood community gardens. The goals of these projects are to contribute to the development of decentralized food production and to provide a more environmentally sound, economically viable, and more socially, culturally, and spiritually healthy food system for larger groups of people [4].

Community gardening often occurs on vacant lots in distressed neighborhoods with the intent to reutilize them for community benefits such as fruit and vegetable production, gathering and sitting areas, and other social services [5]. Community gardening projects also revitalize vacant lots, foster local food production, promote social interaction and community building, and improve neighborhood appearance, safety, and prosperity [6]. As a form of green space, community gardens have numerous environmental benefits such as carbon sequestration [7], slowing down rainwater runoff [8]), minimizing the use

of chemical fertilizers, and increasing biodiversity [9]. In addition, community gardens provide several health benefits such as improved diet with increased vegetable intake [10], mental health through stress relief [11], and physical health thanks to physical exercise associated with gardening such as spading, bending, lifting, and raking [12]. Last but not least, community gardens also have economic benefits for being an affordable food source [13].

Although community gardens provide numerous environmental, economic, and social benefits for their residents, they have faced considerable public criticism. They have been lost to other commercial, residential or public land uses due to a lack of power to preserve them or even the ability to organize people to defend the right to use the land for community gardening [3,14–17]. Thus, the level of involvement and public support for community gardens are critical issues influencing the acceptance and permanency of these landscapes in cities [3,18]. For example, the West Loop community garden was closed after neighbors complained about rats in the community garden [19]. Similarly, a community garden in southeast Fort Collins at English Ranch Park was closed after strong neighborhood opposition [20]. Furthermore, Morckel mentioned that officials of New York City and Columbus, Ohio, do not want to receive complaints from residents about how community garden parcels look. Morckel argued that there are various views for community garden sites such as community gardens should be pleasant, neat, and orderly [21,22]. As discussed by Aptaker; however, this view might be contradictory to other approaches such as the private land view, farm view, and social space view [21]. In the private land view, people support the idea that community gardens are private even if they are leased, and gardeners should be able to do whatever they want with their plots. In the farm view approach, the main goal of the garden is to grow food, and aesthetic concerns should be minimal in the garden site. In the social space view, it is highlighted that the social roles of the garden are more critical than any other function [21]. These statements show that the functions and environmental features of community gardens matter, and there are different perceptions and preferences towards community garden sites that might influence people's involvement and support for community gardens.

Depending on disciplines and professions there are different paradigms in landscape assessment research to evaluate human-landscape interactions. Maluan [23] reviewed and categorized these approaches. One of the paradigms is the expert evaluation relying on trained professionals' evaluations based on the intrinsic quality of landscape properties [24]. In this technique, there are two main approaches including the physical features approach and the ecological approach. In the physical approach, professionals mostly from the U.S. Forest Service and Bureau of Land Management evaluate the quality of physical components of a landscape such as line, color, and texture [23]. In the ecological approach, professionals evaluate their environment based on biological qualities such as naturalness, ecological integrity, landscape complexity, and diversity [23]. Therefore, this approach is mostly used by ecologists and biologists. On the other hand, there is also a non-expert evaluation paradigm that does not require professionals' evaluation and relies on the public to evaluate the environment [23]. In this paradigm, there are two approaches including an experiential approach and a psychological approach. The experiential approach focuses on people's experience with their environment and is concerned with the user's "sense of place" for the landscape [25]. The psychological approach focuses on people's cognitive reactions evoked by the landscape [26]. Therefore, this approach evaluates people's natural reactions and preferences toward a particular landscape [27]. The main criticism of this approach is it is based on people's perceptions and less on physical features [26]. However, the problem can be minimized using a content-identifying method (CIM) that identifies physical and spatial landscape features [23,28]. Therefore, the psychological approach using landscape preference with the CIM method is considered more reliable compared to the expert evaluation technique because it uses multiple observers [23]. Thus, this technique is widely used by numerous researchers such as Tuan Yi Fu, Ulrich, Herzog, Miller, and R. and S. Kaplan [29–34]. Each technique comes with its advantages and disadvantages,

and all have helped researchers to expand literature about landscape assessment and human-landscape interactions. For this research, the landscape preference method in the psychological approach is chosen because this study focuses on perceptions and attitudes toward community garden landscapes for different groups and the public. Furthermore, the landscape preference approach is a straightforward procedure because preference decisions are easy for people to make and they make numerous preference decisions for their daily routines [23,34]. In the landscape preference approach, researchers use CIM after a scene preference rating survey because preference is a result of perception and cognitive processing and reflects one's innate reaction to a particular landscape [28]. Furthermore, Hammit argues that preference is the result of the combined information regarding how people experience their environment [35]. This approach was developed by Kaplan [36] and uses an image-dependent rating survey to obtain information about people's attitudes and preferences toward landscape features [23]. In this procedure, study participants are asked to rate a series of landscape scenes based on how much they like each scene [37]. Following the scene rating, a data reduction technique, preferable factor analysis, is used to generate scene groups that contain similar stimuli to which people react similarly [23]. Then, these scene groups are analyzed and interpreted based on the content and spatial quality of the environment to reveal people's responses to landscape features [38].

The landscape preference approach in environmental perception research can help to understand the important landscape characteristics and features that may influence people's involvement and support for a particular landscape. As discussed by Kordon (2022) "if a community garden is developed without considering the expectations and preferences of community members, only a small group of people can obtain a benefit which may result in the risk of failure of the community garden project in the long term due to a lack of sufficient support from the broader community" [3]. However, research on people's landscape preferences and attitudes toward community gardens is very limited. Similarly, Morckel [22], Draper and Freedman [39], and Guitard et al. [40] highlighted the lack of studies focusing on people's landscape preferences and the perceived attractiveness of community garden sites.

To help fill this gap in the literature, the objective of this study is to identify environmental factors and landscape features that affect the gardener and non-gardener residents' preferences for community garden landscapes. Thus, this study asks the following research questions: 1) What are the environmental factors and landscape features that significantly affect people's attitudes and preferences for community garden landscapes? 2) Do landscape attitudes and preferences differ for community gardeners, community and home gardeners, home gardeners, and non-gardeners?

Most cities have local design guidelines for particular landscape types to successfully develop and maintain services for their residents. However, design guidelines based on people's attitudes and perceptions for community gardens are rare. The findings of this study will help planners, designers, and garden managers develop more successful community garden designs and management strategies to minimize possible public opposition and increase public involvement and support for community garden programs. The intent is not to obligate community groups to follow predetermined design rules for community gardens under the supervision of a landscape designer; rather the purpose is to identify what landscape characteristics should be given priority in the design of community garden sites. This study will identify which aspects of the community garden environment are essential for increased landscape preferences and to achieve a balance between community gardeners and nearby residents regarding their desired landscape features and functions in the community garden site.

This paper is structured as follows. The study area section introduces the study neighborhoods and community garden locations. The methods section describes study participants, survey instruments, and data analysis procedures. The results section represents research findings based on the preference survey data. The discussion section explains the findings of the study, summarizes the important outcomes, and discusses their

implications for practice. The final section concludes the study with recommendations for future research.

## 2. Study Area

Considering the benefits of community gardens, their successful development and long-term permanency are more important, especially for the neighborhoods where people have suffered from food insecurity [1] [41], low income [2], and low access [3] to grocery stores. Food insecurity is an increasing concern for the majority of Roanoke City. Therefore, this study focuses on people from the local communities in different neighborhoods in the City of Roanoke, Virginia. Five different neighborhoods including Shenandoah West, Hurt Park, Mountain View, Old Southwest, and Kenwood Neighborhoods in the City of Roanoke were chosen as the study area. These neighborhoods are located in low-income tracts. Shenandoah West, Hurt Park, Mountain View, Old Southwest, and Kenwood neighborhoods are also located in low-access tracts [42]. There were eight community gardens within the limits of these neighborhoods. Community garden locations and neighborhood limits are presented in Figure 1a,b.

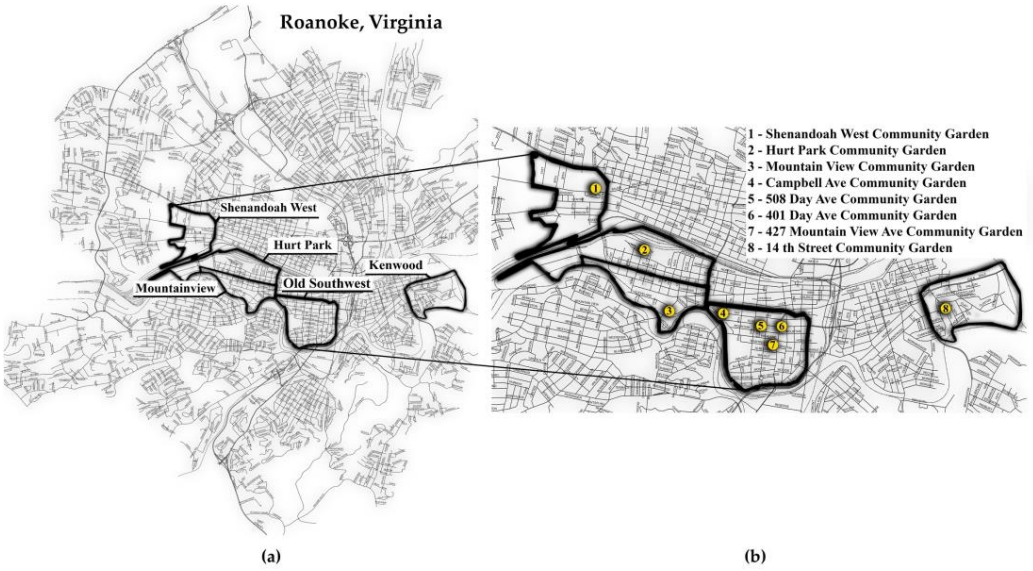


**Figure 1.** (**a**) Maps of neighborhood limits. (**b**) Maps of community garden locations.

## 3. Materials and Methods

The methods section describes the research methods used to accomplish the study objectives including the study participants, the photo selection procedure for the preference survey, the survey administration process, and the data analysis procedures.

The landscape preference survey approach was used for this study because it is one of the most suitable methods for quantitatively revealing patterns in people's attitudes and preferences, not only for natural landscapes but also for built landscapes such as community gardens.

### *3.1. Study Participants*

In order to understand potentially important differences in the landscape attitudes and perceptions of key groups that one would expect to have different exposure to and attitudes toward community gardens were identified. Four groups of people were identified as survey participants. The groups are community gardeners, community and home gardeners, only home gardeners, and non-gardeners.

Community gardeners are the members of the community gardens identified above. They include those who garden both in the community garden and home gardens and those who only garden in the community garden. The researcher reached members through the

managers of community gardens using their listserv and personal contact information. Non-community gardeners are residents who do not participate in any of the above-mentioned community gardens but live in the neighborhoods mentioned above. They were chosen since they live close to a community garden. Thus, it was expected that these residents have had experience or interaction with the community garden environment. There were two types of non-community gardeners: those who garden at home and those who do not garden.

A systematic sampling method was used based on the location of the community gardens. Starting with households on the same street in which the community garden is located, door-to-door visits were conducted for every household. Residents who were less than 18 years old were excluded as were those who did not respond to the door or declined to participate. The researcher also reached residents through the leaders of the neighborhood groups using their listserv and personal contacts to reach more people in the neighborhoods.

### *3.2. Photographs*

More than 600 photographs were taken from eight community gardens in selected neighborhoods in the City of Roanoke. As recommended by Kim, photographs were taken from viewpoints that might be commonly seen from inside the gardens, as well as from streets and sidewalks [4] around the gardens to ensure that the scenes represent typical views from gardeners' and non-gardeners' perspectives [43]. For this study, scenes were selected to represent a range of diverse landscape contents common in community garden environments. The list of 13 landscape content categories, identified based on a literature review as discussed by Kordon, includes built structures, compost area, garden edges, entrance, gathering area, dense vegetation, moderate level of vegetation, low level of vegetation, paths, raised beds with dense vegetation, raised beds with moderate-level of vegetation density, raised beds with low-level of vegetation density, and seasonality [3]. To ensure that each content type was represented and repeated adequately for statistical analysis, at least four to five scenes for each content type were selected by three landscape architects including the author. In the end, this process produced 53 scenes that were used in the survey. This process is illustrated in Figure 2.

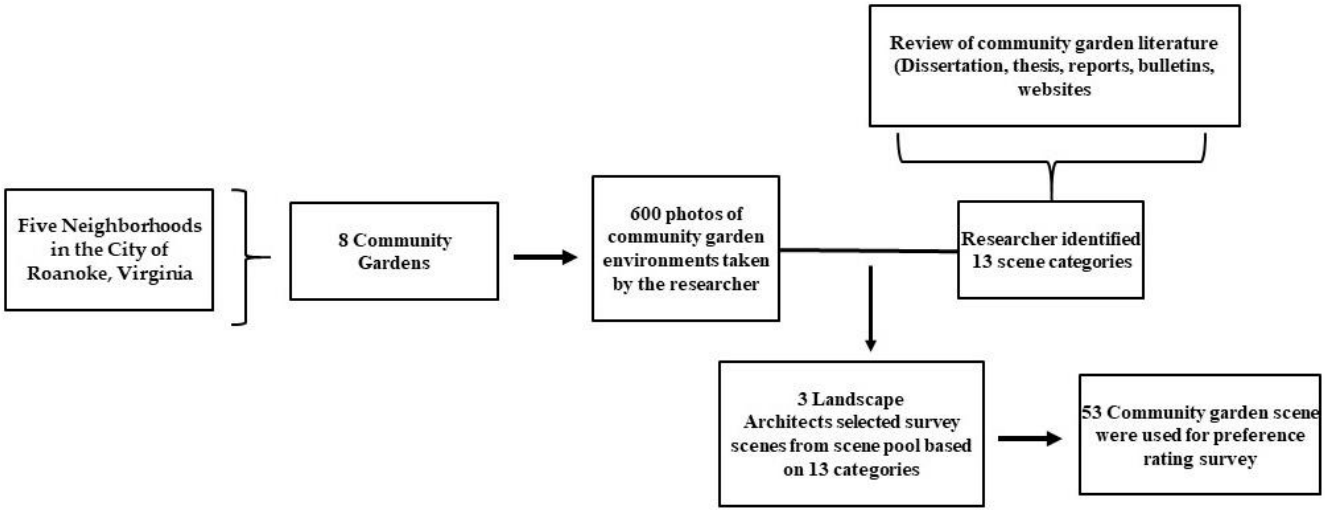


**Figure 2.** Illustration of the scene selection procedure for scene rating survey.

### *3.3. Survey Administration*

Using a random number generator, each scene was assigned a random number and ordered. To reduce the effect of being adjacent to a similar scene in the survey, no more than two consecutive scenes from the same content category were placed adjacent to each other [23]. Three training scenes were placed at the beginning of the scene survey to

familiarize participants with the rating procedure before they rate the original survey scenes. To reduce the order effect, the second version of both online and hard copy surveys was developed in which the scenes were placed in reversed order. Half of the participants were shown the original scene order, and the other half were shown the reverse order to avoid any order effect. Two scenes were represented per page of letter size ($8.5'' \times 11''$) hard copy survey booklet for effective scene rating [43]. One image on each page was presented for the online survey.

The survey was conducted in several ways: during community meetings, door-to-door visits, and online. An online survey tool called Qualtrics Surveys was used through Virginia Tech for the online version of the survey. Participants were asked to rate the scenes based on a 1 to 5 Likert scale according to how much they liked each scene (1 = dislike, 2 = somewhat dislike, 3 = neither like or dislike, 4 = somewhat like, 5 = like). To obtain the data in the same format, the author manually digitized the responses of hard copy surveys using the Qualtrics Survey tool.

### *3.4. Data Analysis*

All collected data were transferred into a Microsoft Excel file. A dimensional analysis (factor analysis) was performed to identify preference dimensions. Factor analysis is a useful statistical technique for grouping scenes into meaningful dimensions based on similar patterns of scene ratings by participants. Factor analysis was used only to identify the dimensions of participants' preference patterns. It is important to note that the scenes in a dimension have a consistent pattern of ratings, not a similar magnitude of ratings. These patterns are useful for the comprehensive understanding of the stimuli that the participants react to [37]. To identify the reliability of data for factor analysis and to test internal consistency among items in each dimension, a reliability test was conducted using a Cronbach Alpha test [23]. The results of the Cronbach Alpha test show a moderate to a high level of internal consistency ranging from the lowest point of 0.71 to the highest point of 0.86. The Cronbach Alpha value for the overall internal consistency of the factor analysis was 0.96, which represents a high level of consistency. These Alpha values prove that the data is suitable for factor analysis, and the scenes in each dimension are highly correlated and reliable.

Following the factor analysis, a content-identifying procedure was used to determine the content of the scenes in each dimension. A content-identifying analysis can be conducted based on the content, spatial features, landscape spaciousness, and ground texture by a trained landscape professional [37,43,44]. The researcher, a trained landscape designer with a bachelor's and master's degree in the landscape architecture profession, examined the scenes to identify landscape characteristics common to the scenes in each dimension group. In this analysis, physical content refers to the physical elements present in the scenes, and spatial organization refers to how the space and elements are arranged in the scenes. A dimension variable was then made by averaging the scores for the scenes in each dimension for each survey participant.

In order to identify the most and the least preferred landscape features, the mean preference was calculated for each dimension variable and ranked based on the mean scores. Finally, a customized Kruskal–Wallis test (ANOVA) was used to test whether mean preference variables were significantly different between the four participant groups. A customized Kruskal–Wallis test (ANOVA) was preferred because the data was not normally distributed and participant groups have unequal sample sizes. The Statistical Program for Social Scientists (SPSS) software version 21, licensed through the Student Software Distribution Office at Virginia Tech, was used for all statistical data analysis at the 95% significance level.

## 4. Results

A total of 228 participants (33 community gardeners, 23 community and home gardeners, 68 home gardeners, and 104 non-gardeners) completed the survey. Overall, the

population in the selected neighborhoods is similar to that of the city in terms of race and age groups, but with slightly lower income and education levels (Table 1).

**Table 1.** Demographics of study participants and neighborhood population.

| Categories | | Participants N = 238 | All Neighborhoods N = 7551 |
|---|---|---|---|
| | | % | % |
| **Participant groups** | Community gardener | 14.5 | n a |
| | Home gardener | 29.8 | na |
| | Community and home gardener | 10.1 | na |
| | Non-gardener | 45.6 | na |
| **Gender** | Male | 42.1 | na |
| | Female | 47.4 | na |
| | Not answered | 10.5 | na |
| **Ethnicity** | African American | 39.9 | 38.94 |
| | Caucasian | 51.3 | 54.75 |
| | Asian | 3.5 | 1.38 |
| | Other | 2.6 | 3.58 |
| | Not answered | 2.6 | 1.36 |
| **Age** | 18–24 | 1.75 | 10.25% |
| | 25–34 | 18.34 | 14.02% |
| | 35–44 | 22.71 | 14.01% |
| | 45–54 | 16.59 | 15.43% |
| | 55–64 | 15.72 | 11.75% |
| | 65–74 | 17.9 | 5.11% |
| | 75 and older | 0.87 | 3.65% |
| | Not answered | 6.11 | na |
| **Income level** | Less than $25,000 | 46.49 | 55.37% |
| | $25,000–$49,999 | 23.68 | 29.13% |
| | $50,000–$74,999 | 9.65 | 9.05% |
| | $75,000–$99.999 | 4.39 | 2.95% |
| | $100,000–$149,999 | 3.07 | 2.69% |
| | $150,000 or more | 0.88 | 0.81% |
| | Not answered | 11.84 | na |
| **Education level** | Some high school or less | 14.47 | 29.82% |
| | High school | 42.98 | 35.79% |
| | Some College or Associate Degree | 15.35 | 25.88% |
| | Bachelor's degree | 20.61 | 6.90% |
| | Post-graduate | 6.57 | 1.61% |

These neighborhoods represent more disadvantaged areas of Roanoke City, where people are more likely to experience food insecurity. Given the benefits of community gardens, insights of people from these neighborhoods regarding the landscape preference in community gardens are important for their successful development and long-term existence.

A total of 53 community garden scenes were analyzed, and factor analysis resulted in 37 images in seven different preference dimensions. Mean scores were calculated for each preference dimension. Preference dimensions were listed from highest (4.31) to lowest (2.96) mean scores (Table 2). The dimensions were named by the author based on the most common scene content and spatial organization that best describes the scenes in each dimension.

**Table 2.** Mean ranking of means for preference dimensions.

| Dimensions | Mean | Std. D. | Alpha |
|---|---|---|---|
| Gathering and Seating | 4.31 | 0.29 | 0.80 |
| Plots with Boundaries | 4.12 | 0.24 | 0.86 |
| Focal Points | 3.94 | 0.06 | 0.81 |
| Plots without Boundaries | 3.77 | 0.16 | 0.84 |
| Garden Entrance | 3.51 | 0.53 | 0.71 |
| Untidy Space | 3.03 | 0.39 | 0.86 |
| Composting Structures | 2.96 | 0.42 | 0.78 |

The highest mean rating was "Gathering and Seating" (mean = 4.31) followed by "Plots with Boundaries" (mean = 4.12), "Focal Points" (mean = 3.94), "Plots Without Boundaries" (mean = 3.77), "Garden Entrance" (mean = 3.51), "Untidy Space" (mean = 3.03), "Composting Structures" (mean = 2.96). The overall mean rating for all dimensions was 3.66. The mean score ranking shows that participants prefer scenes that contain clearly defined gathering and sitting areas and provide opportunities for social events and activities. Furthermore, it demonstrates that participants dislike scenes containing untidy garden areas constructed with poorly maintained structures and composting bins, unclear edges, unorganized spaces, uncontrolled weeds, and plant remnants. Preference dimensions are described below with two demonstrative images for each dimension. The full list of the scenes for each preference dimension is provided in Appendix A.

### *4.1. Gathering and Seating*

Community garden scenes composed of landscape elements associated with gathering and seating opportunities received the highest preference rating by the participants (m = 4.31). The "Gathering and Seating" dimension includes five scenes (scenes 45, 24, 44, 15, and 21) of clearly visible gathering and seating opportunities and associated landscape elements in the community gardens (Figure 3). Community gardening might be considered as a solitary activity, but this result shows that people have strong preferences for gathering and socializing opportunities in community gardens. This brings important design recommendations that gathering places should be considered as one of the primary functions in the community garden design agenda. Gathering and seating space includes landscape components such as pavilions, picnic tables, benches, open space, and a fire pit surrounded by chairs.

Regarding spatial organization, the landscape appears to be clearly visible, clean, well maintained, organized, and easily accessible. The presence of well-structured elements, clear edges, plant boxes, and clearly defined spaces increases the legibility [5] [45] of the environment. Because of the different landscape elements and functions, scenes have a moderate to a high level of complexity [6] [46]. In terms of maintenance, all images possess a clean and organized environment without visible litter or damaged structures which increases the neatness of the environment.


**Figure 3.** Two demonstrative images of preference dimension: Gathering and Seating.

### *4.2. Plots with Boundaries*

The second dimension consists of nine scenes (scenes 43, 5, 51, 38, 50, 37, 53, 42, and 41) with an overall mean score of 4.12. The most common feature of this dimension is the presence of well-defined planting areas using plant boxes and clear walking paths between plant beds which induce a more formal garden landscape (Figure 4).


**Figure 4.** Two demonstrative images of preference dimension: Plots with Boundaries.

The use of plant boxes and clear walking paths results in a clean and organized garden appearance which increases the neatness of the environment. Thanks to repeating plant boxes and pathway rows, most of the scenes have a high level of coherence [7] [45] and legibility which increase people's ability to make sense of the landscape and more easily produce a mental map of the environment. Clearly visible walking rows provide easy access to the inside of the garden space and contribute to the mystery [8] of the landscape which increases people's desire to go further inside of the environment. These factors positively influence people's landscape preferences and bring valuable design recommendations which will be discussed in the discussion section.

### *4.3. Focal Points*

This dimension includes three scenes (scenes 16, 7, and 52) with an overall mean score of 3.94 (Figure 5). Although community garden vegetation and activities are very limited in community garden sites because of the seasonality and dormancy, this dimension received the third highest preference rating. The most common feature of this dimension is a structure far-off in the distance which produces a focal point effect in the landscape.


**Figure 5.** Two demonstrative images of preference dimension: Focal Points.

The clear view of clean and smooth ground surfaces provides an open and spacious appearance tending to attract attention to garden structures. These results indicate that people may like clearly visible openness and spaciousness with smooth ground texture in community gardens. This result also highlights the importance of how community garden landscape elements and environment look not only in the growing season but also in the dormant season.

### *4.4. Plots without Boundaries*

The fourth dimension, "Plots without boundaries", consists of five scenes (scenes 56, 25, 36, 26, and 29) with an overall mean score of 3.77 (Figure 6). The most common content of this dimension is planting areas without individual plots and defined boundaries which induce a more informal garden appearance.


**Figure 6.** Two demonstrative images of preference dimension: Plots without Boundaries.

Furthermore, because of the corn-oriented vegetation, the landscape has a monotonous and farm-like appearance in most of the scenes. Due to the lack of raised plant boxes and individual plots, there are no clearly visible boundaries and defined walking paths in the planting area. Therefore, it is difficult to navigate your way in scenes and hard to make a mental map of the environment. Similar to the dimension of "Plots with Boundaries" this dimension has vegetation in the garden area. However, this dimension received a considerably lower mean score possibly due to the lack of defined boundaries in the garden environment. The differences between these two dimensions reveal the importance of raised beds, well-defined boundaries, and clear pathways in community garden design for higher preference.

### *4.5. Garden Entrance*

The fifth preference dimension includes three scenes (Scenes 17, 22, and 19) with an overall mean score of 3.51. The most common feature of this dimension is a view of the entrance of the community gardens with a clear pathway into the garden (Figure 7).


**Figure 7.** Two demonstrative images of preference dimension: Garden Entrance.

This result shows that the entrance of community gardens may induce a focal point effect and attracts people's attention which might be important for people's initial reaction to community garden site. Furthermore, different types of materials were used for each community garden entrance. For example, the community garden entrance is constructed with well-structured picked wooden fences and a community garden sign in scene 17 which received the highest mean preference rating (m = 4.04) in this dimension. The entrance was equipped with a poorly constructed unleveled arbor trellis in scene 19 which received the lowest preference rating in this dimension. These results indicate that the style and the design of community garden entrances might be important factors influencing people's preferences towards community garden landscapes which shows the need for special attention during community garden design.

### *4.6. Untidy Garden Space*

The sixth dimension includes nine scenes (scenes 20, 40, 30, 49, 18, 54, 27, 34, and 35) of untidy garden spaces (Figure 8). This dimension received the second-lowest mean preference rating (m = 3.03). The main feature in these scenes is the intricate and messy look of the garden environment because of the overgrown plants, uncontrolled weeds, unorganized bare soil, poorly structured garden elements, vegetation debris, and improper use of plant supports.


**Figure 8.** Two demonstrative images of preference dimension: Untidy Garden Space.

Therefore, it is difficult to recognize walking paths and to differentiate garden plants from wild weeds in some of the scenes. These features decrease the neatness of the

environment which may potentially reduce people's landscape preference, interest, and involvement in community gardens. This dimension shows that the maintenance style might be an important indicator to develop broader public support for more successful community garden programs.

### *4.7. Composting Structures*

The dimension of Composting Structures consists of three images (scenes 10, 8, and 6). This dimension received the lowest mean preference rating (m = 2.96). The most common feature of this group is clearly visible composting area and bins (Figure 9). Although composting areas and bins are recommended for community gardens due to their functionality, they may have a negative influence on people's preferences and might be a reason for increased opposition from the public possibly because of their messy look and eyesore impression. Furthermore, composting areas might be considered as a sign of neglect and lack of human care for those who are not familiar with the functionality of composting for gardening. In addition, the direct view of the composting area might be perceived as a source of bad smell, attractive for flies and bees, and a nest for wildlife like rodents. All these might have a negative influence on people's preferences in community gardens. Therefore, composting areas and structures need to be carefully designed and placed in community garden design.


**Figure 9.** Two demonstrative images of preference dimension: Composting Structures.

It is important to note that although several factors decreased the mean preference ratings for preference dimensions identified in this study, they still have relatively positive mean scores compared to the mean of the 1 to 5 scale Likert scale (m = 3.00). Only "Composting Structures" has an overall mean score lower than this threshold (m = 2.96). This result implies that people may not like some of the features of the community garden site but they are certainly not against most of the content of scientific findings and proper design and maintenance recommendations. It is possible to increase positive responses to community garden landscapes and develop stronger community support and involvement in community garden programs.

### *4.8. Landscape Preferences Differs between Different Participant Groups*

The second aim of this study is to identify whether landscape preferences differ among participant groups of community gardeners, community and home gardeners, home gardeners, and non-gardeners. This knowledge will help community garden planners, designers, and managers to consider what different groups of people expect from a community garden environment. To achieve this aim, the scene rating survey and scene preference dimensions data were used. Four participant groups were compared to the seven preference dimensions using the MANOVA procedure. Because the MANOVA results showed a significant difference among participant groups, an ANOVA test was used to identify differences between groups. The results of the ANOVA test are shown below (Table 3).

**Table 3.** Comparison of landscape preference dimensions between participant groups.

| Preference Dimensions | ANOVA | | Community Gardener (N = 33) | | Home Gardener (N = 68) | | Community and Home Gardener (N = 23) | | Non Gardener (N = 104) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | F | Sig | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| **Gathering and Seating** | 1.02 | **ns *** | 3.92 | 0.90 | 4.18 | 0.70 | 4.15 | 0.89 | 4.12 | 0.61 |
| **Plots with Boundaries** | 5.12 | 0.002 | 4.38 | 0.46 | 4.12 | 0.65 | 4.27 | 0.68 | 3.92 | 0.70 |
| **Focal Points** | 17.46 | <0.001 | 4.43 | 0.70 | 4.14 | 0.82 | 4.33 | 0.79 | 3.45 | 0.94 |
| **Plots without Boundaries** | 3.01 | 0.031 | 4.05 | 0.89 | 3.62 | 1.04 | 4.03 | 0.93 | 3.63 | 0.78 |
| **Garden Entrance** | 6.48 | <0.001 | 3.77 | 0.55 | 3.70 | 1.04 | 3.90 | 0.93 | 3.22 | 0.94 |
| **Untidy Space** | 10.03 | <0.001 | 3.57 | 0.79 | 3.20 | 0.73 | 3.48 | 1.12 | 2.80 | 0.83 |
| **Composting Structures** | 12.92 | <0.001 | 3.20 | 0.99 | 2.96 | 0.91 | 3.54 | 1.18 | 2.43 | 0.86 |

* ns = Not significant.

The ANOVA results show that there is no significant difference only in the dimension of "Gathering and Seating" between all participant groups ($p > 0.05$) (Figure 10A). This dimension received the highest preference rating from all participant groups. This result shows that a seating space with gathering and socializing opportunities is an important feature not only for community gardeners but also for non- community gardener groups and they prefer gathering and socializing activities in community gardens even if they do not participate in gardening activities. This result highlights the importance of community gardens as a social space and shows the necessity of gathering and social areas in community garden design to develop broader support of non-community gardeners.

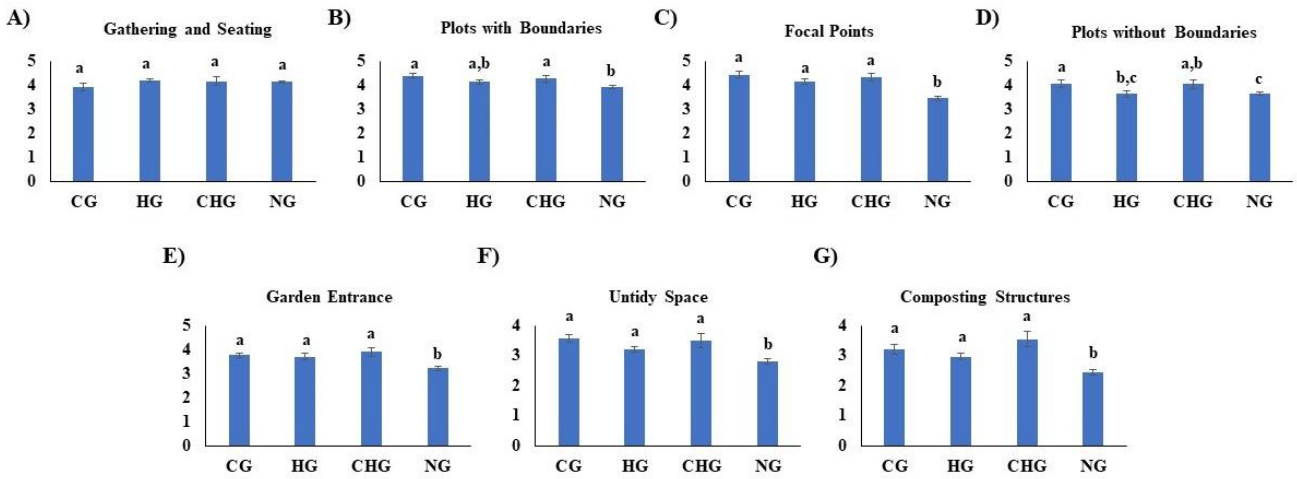


**Figure 10.** Comparison of landscape preference dimensions between participant groups. (**A**–**G**) represent seven preferens dimensions identified. CG: Community Gardener, HG: Home Gardener, CHG: Community and Home Gardener, NG: Non-Gardener. Letters (a b, and c) on the top of the bars indicate significant a difference between groups. Bars with the same letter are not statistically different. ($\alpha = 0.05$).

On the other hand, significant differences were detected for the "Plots with Boundaries" dimension between the groups. For example, the responses of non-gardeners to the "Plots with Boundaries" were significantly less compared to the community gardeners and community and home gardeners ($p < 0.05$) (Figure 10B). However, the preferences of home gardeners for the "Plots with Boundaries" were not significantly different than the other three groups ($p > 0.05$). One possible explanation could be that people who are involved in gardening activities might be well aware of the importance and functionality of defined

boundaries through raised boxes, plant beds, and clear walking paths in the gardening area. These features help gardeners to keep their garden space neat and more organized, control the growth of weeds, provide clean soil on contaminated surfaces [47], and have easy mobility in the garden landscape [48]. Given these benefits, it is not surprising that landscape scenes containing plots with well-defined boundaries receive higher preference ratings from people who participate in gardening activities.

Additionally, the responses of community gardeners and community and home gardeners to "Plots without Boundaries" were significantly higher compared to non-gardeners ($p < 0.05$) (Figure 10D). Community gardens without defined boundaries produced a more informal garden setting, and the overall preference rating decreased for all groups compared to "Plots with Boundaries". Results showed that more informal garden settings received higher preference ratings from community gardeners compared to non-community gardeners. There might be several reasons for this. One possible explanation might be related to familiarity with the community garden environment. Community gardeners are more familiar with the garden landscape, and they may not have difficulties recognizing different areas and functions in community gardens. As a result, they can easily make sense of the garden environment and can navigate their way easily in the landscape.

However, because non-community gardeners are not familiar with the garden site, it might be difficult for them to recognize their ways and differentiate various land uses in community gardens due to the lack of defined boundaries. This may negatively influence their making sense of the landscape resulting in lower preference. In addition, the preferences of the non-gardeners for the "Untidy Space" and "Composting Structure" dimensions were significantly less compared to the other three groups ($p < 0.05$). No significant difference was found among the other gardener groups ($p > 0.05$) for "untidy Space" (Figure 10F) and "Composting Structures" (Figure 10G). This result implies that people who are participating in gardening activities are more tolerant of untidy garden spaces and eyesore impression of composting structures than non-gardeners. One possible explanation is gardeners may be more accepting because they have a better understanding of the reasons for the untidy and sometimes unkempt appearance of the garden place and gardeners are familiar with the necessity and functionality of the composting area so that they can tolerate the unpleasing appearance in gardens. Another possible explanation is familiarity with the garden landscape [16,49,50]. Gardeners spend more time in community gardens compared to non-gardeners, thus gardeners might be more familiar with the garden's appearance and less influenced by the untidiness of the landscape and composting area [16]. Therefore, an untidy garden environment and composting area give a more negative impression to non-gardeners than people who do gardening.

Similarly, the preferences of the non-gardeners for the "Focal Points" and "Garden Entrance" dimensions were significantly lower than the other three groups. There was no significant difference between other gardener groups ($p > 0.05$) for "Focal Points" and "Garden Entrance" (Figure 10F). Community garden entrances and other landscape elements such as pavilions, sheds, benches, garden signs, and arbor trellis produce a focal point effect and give an identity to the landscape where people exhibit their art, culture, and devotion. Therefore, these structures may have special meaning and value for gardeners while focal points and entrance may not be meaningful or appealing for non-gardeners.

These findings imply that people who are participating in gardening activities (community gardening and home gardening) are more tolerant of informal garden environments and untidy garden appearances than non-gardener people. In other words, informal community garden design or an untidy garden environment gives a more negative impression to non-gardener than to people who do gardening. Therefore, landscape preferences of non-gardener groups should be considered during the community garden design to minimize possible opposition and to increase the support of the broader community for community garden projects.

## 5. Discussion

The analysis of the scene rating survey identified seven different preference dimensions which vary in terms of several variables including opportunities and functions, landscape elements, spatial organization, and maintenance style of community gardens. Findings also showed that gardener and non-gardener groups responded differently to these variables. This section discusses these findings in the context of design principles in community gardens.

### *5.1. Collective Decision Making*

As a first design recommendation, it is highly suggested that city officials, design professionals, community garden managers, neighborhood group leaders, community garden members, and public people should come together for local and collective decision-making in the planning, design, and implementation process for community garden projects. The findings showed that there are differences in preferences for community garden landscapes between participant groups: community gardeners, home gardeners, community and home gardeners, and non-gardeners. Thus, if a community garden project is done without an understanding of the non-gardeners' expectations and preferences for community gardens, this may result in increased public opposition and the failure of the community garden project in the long term. If community gardeners do not know about the issues disturbing the public people, they probably overlook the problems that may result in increased criticism by the public. On the other hand, if the public people are not educated regarding the community garden landscapes and the essentials of the community garden design such as composting bins, the variety of vegetations they may negatively react to community gardening projects in their neighborhoods. Similarly, a study mentioned that any attempt to improve the neighborhood environment without community involvement has the risk of ignoring the real problems, and failing the projects may result in a waste of opportunities and resources [51]. Furthermore, another study argued that involving the public's opinions in the development of community garden projects expands the groups of people enjoying the functions of the community garden which increases the chances for the long-term survival of the community garden project [52]. An illustrative chart for the collective decision-making process is provided in Figure 11.

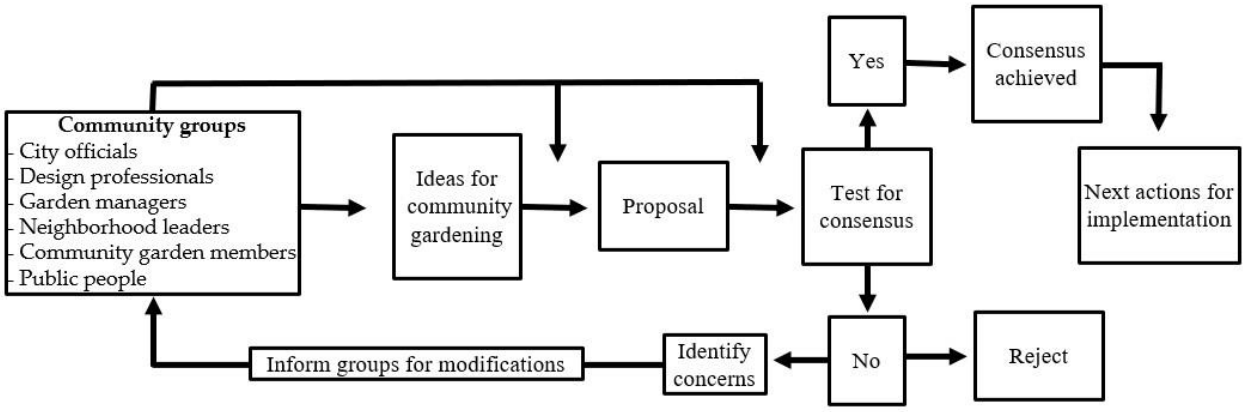


**Figure 11.** Chart for the demonstration of the collective decision-making process.

In addition to collective decision making, this study also provides recommendations regarding the design, spatial organization, and implementation of community garden projects. To simplify the design recommendations, five major approaches to community garden design are discussed.

### *5.2. Garden Entrance and Focal Points*

A well-defined garden entrance supported by well-constructed vertical structures such as fences, arbor trellis, stone walls, signs, and information boards is recommended without blocking the views of community gardens. Community garden entrance and the presence of focal points are two of the important factors influencing people's landscape preferences for community gardens. A possible explanation might be that the presence of a well-defined garden entrance provides a transition border between the garden space and the outside. Therefore, it becomes an important space that attracts people's attention and builds the first impression of residents as well as helps to facilitate good communication for the further relationship of gardeners and also other residents towards the community garden site. In addition, the use of vertical natural (trees, plants, decorative stones, etc.) or human-made structures (pavilions, sculptures, raised beds, etc.) contribute to the development of focal points that prompt people's curiosity regarding what there is behind the border and what functions are offered in the community garden site. These structures also help to produce a welcoming and eye-catching place, improve the complexity of the landscape and provide character to the environment which all positively influence people's desire to become involved in the landscape [53]. Therefore, a community garden site should contain structures that attract people's visual attention and the entrance of a community garden should be designed clearly visible and appealing, while poorly constructed improper materials and unleveled structures should be omitted.

In addition to an attractive entrance and use of focal points, openness and spacious views are other recommended design principles of community gardens. Especially during the dormant season, community gardens lack garden vegetation and activities which may decrease the popularity of the place and the aesthetic value of the environment. Because properly designed and placed garden structures can help to overcome the neglected or abandoned look of community gardens during off-season clear visibility of these structures is important. For example, Saldivar-Tanaka and Krasny found that traditionally developed casitas produce a focal point effect and reflect gardeners' culture [5]. Therefore, the development of community gardens using proper elements that can produce focal point effects in open and spacious areas is recommended, when possible, compared to parcels with blocked views. Openness also enhances the visibility of the environment which enables people to see through the garden space, make sense of the landscape, and understand the environment better.

### *5.3. A Dedicated Social Space*

A dedicated social space equipped with proper landscape elements and designed separated from the gardening area is recommended in community garden projects. All participants highly preferred community garden scenes consisting of gathering and socializing space elements such as pavilions, benches, chairs, tables, shade structures, and fire pit. Therefore, these are the important landscape elements that need to be considered during community garden design. This result shows that community gardens have a role beyond food production, and the social functions of community gardens deserve closer attention during community garden design. Because the areas related to community events (seating, gathering, etc.) are important for both community gardeners and non-community gardeners, community gardens should be designed clearly visible and readily accessible with a dedicated social space open to non-gardener public people.

The availability of social events in community gardens helps to foster community relationships and to attract new people to participate in the garden community for increased support of broader groups which is critical for the long-term survival of community garden programs. For example, Petrovic et.al. argued that and community gardens provide great opportunity to socialize, and the use of social elements highly correlates with people's involvement and connection to community gardens [54]. Considering the structural elements of social space (pavilions, benches, chairs, tables, shade structures, etc.), a dedicated social space also has a great potential to produce an eye-catching focal point

effect. From a theoretical point of view, landscapes with structures, such as shelters, benches, and tables enhance the environment's "affordability" to provide something beneficial to its users [55]. Therefore, people prefer landscapes where they can take benefit of them. In addition, landscape contents that provide parklike opportunities, such as gathering, sitting, etc. enhance the spatial quality of that landscape which supports people's making sense and cognitive image of the environment as well as provides a potential for involvement [37]. Therefore, designing the social space clearly visible from the outside of the garden and close to the entrance of community gardens can offer easy access for non-gardener visitors and would be beneficial to provide a pleasing welcoming area.

The open access design of community gardens and the inclusion of public people in the garden site can increase the involvement and support of broader groups. However, the gardening area might be exposed to pet damage, the danger of theft, vandalism, and overuse of the place as a result of the open access design of the community garden. Furthermore, some of the garden members may want to keep their plots out of the reach of non-gardeners. This may cause conflicts between garden members and public users in long term. Therefore, providing options to garden members for gated and open access allotments could be helpful. It would also be beneficial to distinguish activities and spaces between gardener and non-gardener people. For example, some of the areas directly related to planting activities (planting beds, storage shed, composting area, etc.) should be accessible by the gardeners only, while some of the areas (entrance, seating and gathering area, demonstration plots, or shared plots for visitors) should be accessible for all visitors. In order to separate public and private spaces and to prevent pet, wild life, and theft damages, the use of a see-through fire fencing is recommended in the garden area. It is important to note that the larger group of people benefiting from the functions of a community garden, the higher possibility for the long-term survival of the garden.

### *5.4. Defined Physical Boundaries*

Providing raised beds, planting boxes, well-defined boundaries, and clear pathways in community garden design is critical for positive reactions from the members and neighboring residents of the community gardens. Community gardens have various purposes of use resulting in different areas and land uses in community garden sites including but not limited to gardening, sitting, gathering, storing, and composting. The results showed that the clear distinction of these different uses with defined physical boundaries through clearly edged walking paths, raised beds, and planting boxes induce an organized and more formal setting of community garden landscape which increased landscape preference rating. On the other hand, the lack of raised beds and planting boxes, indefinite boundaries, unclear pathways, and farm-like single garden layout caused a monotonous and more informal garden appearance resulting in a lower preference rating in this study.

People's attitudes toward these factors can be explained in several ways. For example, the use of clear boundaries increases the distinctiveness of the land uses and helps visitors to recognize the landscape elements and functions of the area which increases the legibility of the environment. Similarly, the presence of walking paths between clearly edged raised beds and planting boxes produces a repeating planting area pattern which increases the coherence of the environment. Both legibility and coherence make the environment easier for people to recognize and comprehend [56]. This enhances people's making sense of the environment, helps to build a mental map of the surrounding area, and enables people to navigate their orientation and find their way easily in the landscape [56]. From an evolutionary theory standpoint, people inherently prefer landscapes where they can have the opportunity to easy access food to survive [37,57]. People also feel more comfortable and safer when they can find their way easily, comprehend their environment, and make sense of it possibly because they could escape without difficulty in case of danger [58]. In addition, the presence of clear pathways, plants in straight rows, and planting boxes are signs of human care showing that people are involved in the place, they have personal pride, and adequate time or money to take care of their environments which all positively

influence participants attitudes towards these landscapes [59–61]. Furthermore, gardening increases the sense of responsibility and feeling of nurturing by growing something from seed to blossoming that foster people's pleasure, happiness, and satisfaction [62]. Providing an organized landscape through the use of defined boundaries, raised beds, and planting boxes may increase these positive feelings towards community garden landscapes.

### 5.5. Maintenance Level and Style

The use of sturdy materials for pathways and garden structures is critical, and the maintenance level and neatness of community garden sites and structures are important design principles as much as the content and the spatial organization of the community garden environment. Maintenance level and style are important predictors of people's landscape preferences in community gardens because participants highly rated community garden scenes consist of features such as a clean environment, well-maintained grass and vegetation, clean and organized planting beds, well-constructed community garden structures, etc. On the other hand, participants placed lower scores for community garden scenes containing overgrown plants, uncontrolled weeds, unorganized bare soil, poorly structured garden elements, vegetation debris, and improper use of plant supports. In addition, due to overgrown wild vegetation and the messy appearance of the garden environment, it might be difficult to distinguish different land uses such as planting plots and walking paths which highly reduces the legibility of the environment. These features reduce the evidence of human care, decrease the neatness of the environment and induce an eyesore impression possibly reducing people's landscape preference, interest, and desire to involve in community garden sites. Similarly, Nassauer discussed that the maintenance level and attractiveness of horticulture areas influence the perceived care of the landscape [60]. For example, in this study, scenes 43 and 40 both have high raised beds with garden vegetation. Scene 40 received a lower preference rating possibly due to the occurrence of uncontrolled weeds and the presence of debris and overgrown plants in boxes which cause an untidy garden appearance. Similarly, scenes 10 and 6 both have composting bins but scene 6 received a considerably lower preference rating probably because of the poorly constructed wood structures and unplaced wood pieces that induce an unkempt and damaged appearance, while scene 10 includes properly labeled, and orderly placed compost bins structured with sturdy wood and wire net materials showing the human care and higher maintenance.

### 5.6. Hiding Garden Eyesore

Any unappealing views such as composting areas and structures should be placed where human interaction is minimal, away from the entrance and social areas, and out of direct view of people. The use of landscape elements such as decorative objects, vertically grown plants, wood panel trellis, etc. can be an aesthetic and practical approach in community garden design to hide unpleasing views. The use of decorative structures and plants in other parts of the community garden may also help to attract people's attention to somewhere away from the composting area in the community garden. The neatness and maintenance level of community garden sites and structures are important for peoples' preferences in community gardens, and features such as overgrown wild vegetation, plant debris, and randomly placed materials induce an untidy appearance and eyesore impression. Therefore, the source of any unpleasing views should be properly maintained or removed from the site. As also discussed by Surls et.al., plant debris and composting areas might be a source of conflicts between community groups, and gardeners should properly maintain plant compost [63]. However, removing from the site may not be an option for some of the structures. For example, composting areas and bins are beneficial and functional structures for nutritious garden soil but they might be the reason for lower landscape preference and increased opposition from the public possibly due to their messy look and eyesore appearance. Then, hiding unpleasant garden structures like compost bins from people's direct view is a recommended approach in community garden design to

reduce the possibility of receiving complaints or bad attitudes from the community garden residents. In general, results showed that people's landscape preferences depend on the content and spatial organization of the community garden landscape, maintenance level and style of the garden site and structures, and the functions that community gardens offer to its participants. A summary chart of the main findings and discussions is provided in Figure 12.

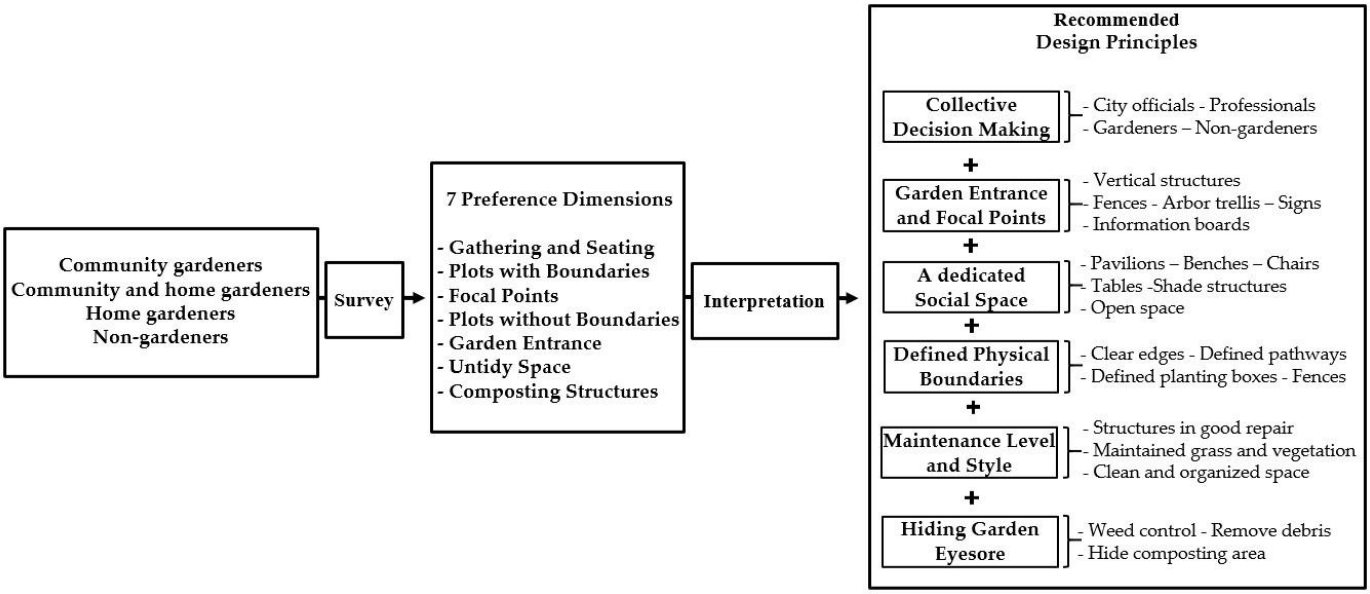


**Figure 12.** Summary chart for result and discussion sections.

In particular, participants positively responded to community garden scenes with highly legible and well-maintained community garden landscapes equipped with eye-catching entrance, well-constructed raised beds, pavilions, pathways, and sitting structures for social events. On the other hand, participants negatively responded to community garden scenes consisting of unorganized garden spaces, unkept weeds and garden vegetation, and poorly constructed structures. Based on these findings, this research recommends six main design principles for community garden landscapes including "collective decision making" in the design and maintenance process of community gardens, the use of attractive and welcoming "garden entrance and focal points", "a dedicated social space" for community activities, use of "defined physical boundaries", special attention for "maintenance level and style", and "hiding garden eyesore" from direct view of people (Figure 12).

## 6. Conclusions

Community gardening is an appealing approach as a response to the negative impacts of the industrialized food system. Furthermore, community gardens provide a wide range of economic, environmental, health, and social benefits for not only their users but also public residents. In order to deliver these advantages to a broader group of people for a longer period, community gardens should be designed for the benefit of both gardeners and those who do not garden but live nearby a community garden. This study showed that community gardens offer various functions for different groups of people resulting in different attitudes and perceptions towards these landscapes. When the differences in gardeners' and non-gardeners' attitudes and perceptions are not addressed, there might be a risk of increased public criticism toward community gardens threatening their long-term survival. If the community garden projects are to be successful, non-gardener people's preferences should be considered in these landscapes' design and long-term maintenance process. This study provides valuable knowledge regarding the landscape preferences of gardeners and non-gardeners and addresses the differences between these groups. These findings highlight the importance of this study and show the necessity of participatory

design approaches for local and collective decision-making for community garden projects. The design recommendations of this study can be used to reconcile the differences among different community groups to minimize possible complaints and develop broader public support for more successful community garden programs. With the collective decision-making process, the recommendations of this study can also contribute to the acceptance of community gardens by the increased number of people and the long-term existence of gardens in urban neighborhoods. Finally, this study focused on neighborhood community gardens. Considering the diversity of community garden types such as school gardens, therapeutic gardens, and senior gardens, the extension of this research to other community garden types and their residents can provide a great contribution to the community garden literature. In addition, this study identified the main landscape features important to the gardener and non-gardener groups. However, this study did not test the influence of sub-variables such as plant types, color, texture, etc. on people's preferences. It might be helpful to identify the influences of these variables in future studies. Moreover, this study recommended a collective decision-making process in community garden design and maintenance. However, this study did not address how this decision-making process might be effective. Therefore, future community garden studies should keep investigating people's perceptions of community garden environments and identify strategies to effectively bring different groups together for collective decision-making. In addition, this study was conducted in five different neighborhoods of Roanoke, Virginia. It is expected that the survey results would be similar in other neighborhoods where the population demographics are similar and community garden landscapes are similar to this study. However, further research is recommended on different types of community gardens in different neighborhoods in varied cities to confirm the findings of this study and expand the knowledge about these promising landscapes in cities.

**Author Contributions:** Conceptualization, S.K.; methodology P.A.M. and S.K.; software, S.K.; validation, S.K., P.A.M. and C.L.B.; formal analysis, S.K.; investigation, S.K.; resources, S.K.; data curation, S.K.; writing—original draft preparation, S.K.; writing—review and editing, S.K., P.A.M. and C.L.B.; visualization, S.K.; supervision, P.A.M. and C.L.B.; project administration, S.K., P.A.M. and C.L.B. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** An approval for research involving human subjects was obtained from the Institutional Review Board (IRB) Office of Research Compliance of Virginia Tech with the IRB number 17-598 on 4 May 2018.

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** The data presented in this study are available on request from the corresponding author. The data are not publicly available due to the need to protect the identity of the participants.

**Acknowledgments:** The open access publishing fees for this article have been covered by the Virginia Tech's Open Access Subvention Fund (OASF), supported by the University Libraries. I would like to thank to Adef Kordon for her technical support during this research.

**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A


**Figure A1.** Scenes of preference dimension of Gathering and Seating.


**Figure A2.** Scenes of preference dimension of Plots with Boundaries.


**Figure A3.** Scenes of preference dimension of Focal Points.


**Figure A4.** Scenes of preference dimension of Plots without Boundaries.


**Figure A5.** *Cont*.


**Figure A5.** Scenes of preference dimension of Untidy Space.


**Figure A6.** Scenes of preference dimension of Garden Entrance.


**Figure A7.** Scenes of preference dimension of Composting Structures.

## Notes

1 USDA defines food insecurity as " . . . a household-level economic and social condition of limited or uncertain access to adequate food". 63. USDA. Definitions of Food Security. Available online: https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-u-s/definitions-of-food-security/ (accessed on 3 August 2022).

2 A low-income tract has a poverty rate of greater than 20 percent or has a median family income of less than or equal to 80 percent of the state's median family income. 24. USDA. Food Access Research Atlas. Available online: http://www.ers.usda.gov/data-products/food-access-research-atlas.aspx (accessed on 5 May 2018).

3 A low access tract includes at least 500 people, or 33 percent of the population living more than 0.5 miles (in urban areas) or more than 10 miles (in rural areas) from the nearest grocery store. Ibid.

4 The researcher photographed the scenes using a digital camera with 12.1 megapixel and a 12 optical zoom lens.

5 *Legibility* deals with the organization of the three-dimensional ground plane of a setting. It is about the distinctiveness of an environment. Landmarks, focal points, or other distinctive and memorable components make the scene more legible. 45. Kaplan, R.; Kaplan, S.; Ryan, R.L. *With people in mind: design and management of everyday nature*; Island Press: Washington, D.C, 1998.

6 *Complexity* refers to the diversity and richness of the elements in an environment. A complex setting has many different distinct components to recognize. 46. Kaymaz, I.C. *Landscape perception*; INTECH Open Access Publisher: 2012.

7 *Coherence* refers to the holistic organization of the components of a surface level analysis in a setting. It includes the factors which make the picture plane easier to recognize, to comprehend, and to organize. 45. Kaplan, R.; Kaplan, S.; Ryan, R.L. *With people in mind: design and management of everyday nature*; Island Press: Washington, D.C, 1998.

8 *Mystery* can be explained as one's desire to explore more about the setting's potential of promising information. Ibid.

## References


1. Hendrickson, M.K.; Heffernan, W.D. Opening Spaces through Relocalization: Locating Potential Resistance in the Weaknesses of the Global Food System. *Sociol. Rural.* **2002**, *42*, 347–369. [CrossRef]
2. Lawson, L.; Drake, L. *Community Gardening Organization Survey 2011–2012*; American Community Gardening Association Rutgers University: College Park, Georgia, 2012.
3. Kordon, S. Understanding People's Perceptions and Attitudes toward Community Garden Landscape in Roanoke, Virginia. Ph.D. Thesis, Virginia Tech, Blacksburg, VA, USA, 2022.
4. Feenstra, G. Creating space for sustainable food systems: Lessons from the field. *Agric. Hum. Values* **2002**, *19*, 99–106. [CrossRef]
5. Saldivar-tanaka, L.; Krasny, M.E. Culturing community development, neighborhood open space, and civic agriculture: The case of Latino community gardens in New York City. *Agric. Hum. Values* **2004**, *21*, 399–412. [CrossRef]
6. Ohmer, M.L.; Meadowcroft, P.; Freed, K.; Lewis, E. Community gardening and community development: Individual, social and community benefits of a community conservation program. *J. Community Pract.* **2009**, *17*, 377–399. [CrossRef]
7. Ellison, L.; Bakshi, N.; Fletcher, M.; Vale, B. Beyond the Community Garden. *Cent. Build. Perform. Res.* **2021**.
8. Gittleman, M.; Farmer, C.J.; Kremer, P.; McPhearson, T. Estimating stormwater runoff for community gardens in New York City. *Urban Ecosyst.* **2017**, *20*, 129–139. [CrossRef]
9. Clarke, L.W.; Jenerette, G.D. Biodiversity and direct ecosystem service regulation in the community gardens of Los Angeles, CA. *Landsc. Ecol.* **2015**, *30*, 637–653. [CrossRef]
10. Litt, J.S.; Soobader, M.-J.; Turbin, M.S.; Hale, J.W.; Buchenau, M.; Marshall, J.A. The influence of social involvement, neighborhood aesthetics, and community garden participation on fruit and vegetable consumption. *Am. J. Public Health* **2011**, *101*, 1466–1473. [CrossRef]
11. Hayashi, N.; Wada, T.; Hirai, H.; Miyake, T.; Matsuura, Y.; Shimizu, N.; Kurooka, H.; Horiuchi, S. The effects of horticultural activity in a community garden on mood changes. *Environ. Control. Biol.* **2008**, *46*, 233–240. [CrossRef]
12. Gregis, A.; Ghisalberti, C.; Sciascia, S.; Sottile, F.; Peano, C. Community garden initiatives addressing health and well-being outcomes: A systematic review of infodemiology aspects, outcomes, and target populations. *Int. J. Environ. Res. Public Health* **2021**, *18*, 1943. [CrossRef]
13. Kantor, L.S. Community food security programs improve food access. *Food Rev./Natl. Food Rev.* **2001**, *24*, 20–26.
14. Kurutz, S. In a Downtown War of Roses, a Garden Loved, and Unloved. Available online: http://www.nytimes.com/2004/11/14/nyregion/thecity/14gard.html?_r=2&scp=1&sq=community+garden+eyesore&st=nyt&oref=slogin&oref=slogin (accessed on 10 December 2019).
15. Pothukuchi, K.; Kaufman, J.L. Placing the food system on the urban agenda: The role of municipal institutions in food systems planning. *Agric. Hum. Values* **1999**, *16*, 213–224. [CrossRef]
16. Surratt, M. Approaching the Community Garden: How Physical Features Affect Impression. Master's Thesis, Cornell University, Ithaca, NY, USA, 2010.
17. Twiss, J.; Dickinson, J.; Duma, S.; Kleinman, T.; Paulsen, H.; Rilveria, L. Community Gardens: Lessons Learned From California Healthy Cities and Communities. *Am. J. Public Health* **2003**, *93*, 1435–1438. [CrossRef]
18. Tidball, K.G.; Krasny, M.E. From risk to resilience: What role for community greening and civic ecology in cities. *Soc. Learn. Towards A More Sustain. World* **2007**, 149–164.
19. Peña, M. West Loop Community Garden Shut Down after Rat Complaints. Available online: https://blockclubchicago.org/2019/08/01/west-loop-community-garden-shut-down-after-neighbors-say-parade-of-rats-spotted/ (accessed on 12 December 2019).
20. Duggan, K. Neighborhood Complaints Shut Down SE Community Garden. Available online: https://www.coloradoan.com/story/news/local/2015/02/06/neighborhood-complaints-community-garden/23007519/ (accessed on 12 December 2019).
21. Aptekar, S. Visions of Public Space: Reproducing and Resisting Social Hierarchies in a Community Garden. In *Sociological Forum*; Wiley Online Library: Hoboken, NJ, USA, 2015; pp. 209–227.
22. Morckel, V. Community gardens or vacant lots? Rethinking the attractiveness and seasonality of green land uses in distressed neighborhoods. *Urban For. Urban Green.* **2015**, *14*, 714–721. [CrossRef]
23. Maulan, S. A perceptual study of wetlands: Implications for Wetland Restoration in the Urban Areas in Malaysia. Ph.D. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA, USA, 2006.
24. Zube, E.H.; Sell, J.L.; Taylor, J.G. Landscape perception: Research, application and theory. *Landsc. Plan.* **1982**, *9*, 1–33. [CrossRef]
25. Tuan, Y.F. *Space and Place: The Perspective of Experience*; U of Minnesota Press: Minneapolis, MN, USA, 1977.
26. Daniel, T.C.; Vining, J. Methodological issues in the assessment of landscape quality. In *Behavior and the Natural Environment*; Springer: Berlin/Heidelberg, Germany, 1983; pp. 39–84.
27. Lekagul, A. A Preference Study of the Traditional Thai Market Place: A Management and Preservation Tool for Vernacular Environments. Ph.D. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA, USA, 2002.
28. Kaplan, R. Preference and everyday nature: Method and application. In *Perspectives on Environment and Behavior*; Springer: New York, NY, USA, 1977; pp. 235–250.
29. Ulrich, R.S. Aesthetic and affective response to natural environment. In *Behavior and the Natural Environment*; Springer: Boston, MA, USA, 1983; pp. 85–125.
30. Ulrich, R.S. Human responses to vegetation and landscapes. *Landsc. Urban Plan.* **1986**, *13*, 29–44. [CrossRef]
31. Herzog, T.R. A cognitive analysis of preference for field and forest environments. *Landsc. Res.* **1984**, *9*, 10–16. [CrossRef]

32. Herzog, T.R.; Kaplan, S.; Kaplan, R. The prediction of preference for unfamiliar urban places. *Popul. Environ.* **1982**, *5*, 43–59. [CrossRef]
33. Kaplan, R. The analysis of perception via preference: A strategy for studying how the environment is experienced. *Landsc. Plan.* **1985**, *12*, 161–176. [CrossRef]
34. Miller, P.A. *Visual Preference and Implications for Coastal Management: A Perceptual Study of the British Columbia Shoreline*; University of Michigan: Ann Arbor, MI, USA, 1984.
35. Hammitt, W.E. *Visual and User Preference for a Bog Environment*; University of Michigan: Ann Arbor, MI, USA, 1978.
36. Kaplan, S.; Kaplan, R.; Wendt, J.S. Rated preference and complexity for natural and urban visual material. *Percept. Psychophys* **1972**, *12*, 354–356. [CrossRef]
37. Kaplan, R.; Kaplan, S. *The Experience of Nature: A Psychological Perspective*; Cambridge University Press: Cambridge, NY, USA, 1989.
38. Kaplan, S.; Kaplan, R. *Cognition and Environment: Functioning in an Uncertain World*; Ulrichs Books: Ann Arbor, MI, USA, 1989.
39. Draper, C.; Freedman, D. Review and analysis of the benefits, purposes, and motivations associated with community gardening in the United States. *J. Community Pract.* **2010**, *18*, 458–492. [CrossRef]
40. Guitart, D.; Pickering, C.; Byrne, J. Past results and future directions in urban community gardens research. *Urban For. Urban Green.* **2012**, *11*, 364–373. [CrossRef]
41. USDA. Definitions of Food Security. Available online: https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-u-s/definitions-of-food-security/ (accessed on 3 August 2022).
42. USDA. Food Access Research Atlas. Available online: http://www.ers.usda.gov/data-products/food-access-research-atlas.aspx (accessed on 5 May 2018).
43. Kim, E.J. Toward Local Brownfield Regeneration: Factors Affecting People's Attitude and Preference of Brownfield Landscape. Ph.D. Thesis, Virginia Tech, Blacksburg, VA, USA, 2015.
44. Kaplan, S. Perception and landscape: Conceptions and misconceptions. In Proceedings of Our National Landscape: A Conference on Applied Techniques for Analysis and Management of the Visual Resource, Berkeley, CA, USA, 23–25 April 1979.
45. Kaplan, R.; Kaplan, S.; Ryan, R.L. *With People in Mind: Design and Management of Everyday Nature*; Island Press: Washington, DC, USA, 1998.
46. Kaymaz, I.C. *Landscape Perception*; INTECH Open Access Publisher: London, UK, 2012.
47. Barbolet, H.; Cuddeford, V.; Salle, J.D.L.; Geggie, L.; Rideout, K. *Dig It! A Practical Toolkit. How Local Governments can Support Community Gardens*; Spring: New York, NY, USA, 2009; p. 53.
48. Hutchison, K.G. *Building Community Gardens in Montana*; Alternative Energy Resources Organization: Helena, MT, USA, 2011; p. 8.
49. Devlin, K.; Nasar, J.L. The beauty and the beast: Some preliminary comparisons of 'high'versus 'popular'residential architecture and public versus architect judgments of same. *J. Environ. Psychol.* **1989**, *9*, 333–344. [CrossRef]
50. Kaplan, R.; Herbert, E.J. Cultural and sub-cultural comparisons in preferences for natural settings. *Landsc. Urban Plan.* **1987**, *14*, 281–293. [CrossRef]
51. Yazid, M.; Yunos, M.; Kalsum, N.; Isa, M.; Utaberta, N.; Ismail, N.; Ismail, S. The issues of public participation in garden design process: An analytical discourse. *Adv. Environ. Biol.* **2015**, *9*, 404–409.
52. Göttl, I.; Penker, M. Institutions for collective gardening: A comparative analysis of 51 urban community gardens in Anglophone and German-Speaking countries. *Int. J. Commons* **2020**, *14*, 30–43. [CrossRef]
53. Junge, X.; Schüpbach, B.; Walter, T.; Schmid, B.; Lindemann-Matthies, P. Aesthetic quality of agricultural landscape elements in different seasonal stages in Switzerland. *Landsc. Urban Plan.* **2015**, *133*, 67–77. [CrossRef]
54. Petrovic, N.; Simpson, T.; Orlove, B.; Dowd-Uribe, B. Environmental and social dimensions of community gardens in East Harlem. *Landsc. Urban Plan.* **2019**, *183*, 36–49. [CrossRef]
55. Gibson, J.J. *The Ecological Approach to Visual Perception: Classic Edition*; Psychology Press: London, UK, 2014.
56. Kaplan, R. Patterns of environmental preference. *Environ. Behav.* **1977**, *9*, 195–216. [CrossRef]
57. Balling, J.D.; Falk, J.H. Development of visual preference for natural environments. *Environ. Behav.* **1982**, *14*, 5–28. [CrossRef]
58. Herzog, T.; Smith, G.A. Danger, mystery, and environmental preference. *Environ. Behav.* **1988**, *20*, 320–344. [CrossRef]
59. Nassauer, J.I. Care and stewardship: From home to planet. *Landsc. Urban Plan.* **2011**, *100*, 321–323. [CrossRef]
60. Nassauer, J.I. The aesthetics of horticulture: Neatness as a form of care. *HortScience* **1988**, *23*, 973–977. [CrossRef]
61. Nassauer, J.I. *Cultural Sustainability: Aligning Aesthetics and Ecology*; Island Press: Washington, DC, WA, USA, 1997.
62. Schott, R. How Does Gardening Make You Happier. Available online: https://www.scienceworld.ca/stories/how-does-gardening-make-you-happier/ (accessed on 21 August 2022).
63. Surls, R.; Director, U.C. *Community Garden Start-Up Guide*; University of California Cooperative Extension: Los Angeles, CA, USA, 2001; p. 6.