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Socio-Cultural Appropriateness of the Use of Historic Persian Gardens for Modern Urban Edible Gardens

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Abstract: Historic gardens have the ability to provide several ecosystem services in cities, including provisioning services (i.e., food production). The historic gardens in Iran (known as "Persian Gardens") have never been considered as places that could be used for food production. As a result, the purpose of this paper is to investigate whether the Iranian historic gardens' spatial and structural layout is suitable for modern urban food gardening. We conducted field studies in six recognized Persian gardens in four provinces of Iran via qualitative analysis according to socio-cultural guidelines drawn from a literature review. The results suggested that combining the elements of formal landscape design, non-edible decorative plants, and traditional artwork would increase the Persian gardens' attractiveness. Regarding encouraging users to become involved in urban gardening, we found that separating productive units containing edible plants from public units using a central meeting spot populated by aesthetic plants and items may attract ordinary visitors who are interested in gardening without disturbing anyone's activities. Furthermore, the Persian gardens' multifunctionality, aesthetic value, and health-promoting qualities constitute a considerable historic achievement in garden design, making the gardens a suitable model for edible urban gardening. The results of this study can enhance our understanding of the Persian gardens' spatial and structural design and provide practical implications for sustainable urban planning and landscape architecture.

Keywords: food gardening; edible green infrastructure; Persian garden; socio-cultural guidelines; cultural landscape; urban ecosystem services; landscape architecture

Citation: Amani-Beni, M.; Xie, G.; Yang, Q.; Russo, A.; Khalilnezhad, M.R. Socio-Cultural Appropriateness of the Use of Historic Persian Gardens for Modern Urban Edible Gardens. *Land* **2022**, *11*, 38. https://doi.org/10.3390/land11010038

Academic Editor: Thomas Panagopoulos

Received: 9 November 2021
Accepted: 21 December 2021
Published: 27 December 2021

1. Introduction

Urban agriculture as a tool to promote urban resilience and improve the health system of citizens has been well considered in the Global North [1–3]. In addition, countries such as China [4,5] and Cuba [6], among others have made remarkable progress in supporting and developing urban agriculture. Iran is a country that despite the rich history of urban agriculture and richness of native fruit species [7], today has not paid serious attention to urban agriculture. One of the most basic methods of preserving the vegetation of cities (both productive and decorative) is the laws that in the last 40 years many of them by legal authorities in Iran (such as the Islamic Consultative Assembly, Ministry of Agriculture, and the Supreme Council of Architecture and urban planning) has been approved [8]. Most of these are laws that seek to preserve the use of agricultural lands and gardens and the preservation and expansion of green space in cities, do not have a strong enforcement guarantee [8]. In general, despite the multiplicity of laws, there is not enough support for

growing edible plants and horticultural activities in cities [9]. The issue of urban agriculture as a governance approach first entered the Iranian executive literature in 2021 through top-down governance by the Ministry of Roads and Urban Development (MRUD). MRUD announced the plan "Development of Urban Agriculture in Parks and Equipped Urban Spaces" (DUAP) carried out by Shahid Beheshti University to the executive areas of the subdivision. In this project, for the first time, the need to pay attention to the use of agricultural heritage and historical methods of urban agriculture in Iran in the planning and design of urban agricultural spaces was mentioned. Nevertheless, Iranian architecture and urban planning have traditionally had productive green spaces and agriculture [10]. Iranian yards and gardens that were built in or around cities have always had edible plants and ornamental plants [11]. Today, the remains of these historic green spaces, either in the form of Persian gardens or parks, are being protected by the Ministry of Cultural Heritage, Tourism and Handicrafts, or the municipalities.

Before the communiqué of DUAP, in many cities of Iran, productive green space was planted, but based on the interests of citizens or municipal experts, not based on a comprehensive study plan with a scientific approach. For example, the public green space of Shiraz, as one of the most important cities in southern Iran, has orange, palm and mulberry fruit trees. The streets of the northern cities of Iran are full of olive trees. In southwestern Iran, the cities of Bushehr and Qasr Shirin have palm trees. Some western cities of Iran, such as Tuyserkan, have walnuts and almonds. In Tehran, fruit trees have recently been planted by the Parks and Green Space Organization. For example, 36,000 fruit trees have been planted in Velayat Park and in 13th municipal district, the construction of fruit parks has been regarded as one of the urban green space projects [12]. In addition to these cities, many other cities in Iran pay more attention to fruit trees and productive green space. Study of [13] on the main strategies for cultivation of fruit trees and shrubs in Iran's urban landscapes showed using native fruit trees like almonds, grapes, pistachios, jujubes, olives, pomegranates, figs, and mulberries with low water requirements compared to conventional urban park design approach can be profitable by reducing the costs of the construction and maintenance, and also through increasing the incomes. The study of Hosseinpour et al. [14] provides a framework which helps landscape architects on a cost-benefit applying urban agriculture in sustainable park design in Iran through planting fruit trees, vegetables, and other productive plants in urban landscaping. For example, Golab cultivar of apple, have already been adapted to the local urban conditions of Iran, so landscape development through urban agriculture can benefit from these variations of plants [13].

But the disadvantage of many of these activities is that Iranian citizens do not play a significant role in planting and cultivating edible plants in cities. Therefore, to achieve a comprehensive and sustainable approach to urban agriculture in Iran, there is a need for pilot projects that test how public can participate in urban agriculture. Previous studies show that in order to find the best way to locate and involve citizens in urban agriculture and create an edible city, there are experimental sites as the live laboratories [15]. For example, in Switzerland the Agro-urban Park of Bernex is the first of its kind which is piloted by the canton of Geneva, aiming to propose a test plot for interaction between the urban population and the farming sector [16]. For the first time in Iran, such a park is to be built in Mashhad, the second largest city in Iran. Detailed documents regarding the approach of Mashhad Municipality to this project have not been published yet. But in general, little field studies have been done on how to integrate urban agriculture in Iranian cities. The lack of studies on urban agriculture and the lack of test plots to study the interaction between production and leisure, between farmers and the urban population made Khalilnezhad et al. [17] consider the historical gardens as one of the most suitable urban spaces to start urban agriculture. The study of Khalilnezhad et al. [18] on the historical gardens of Birjand shows that while many of these gardens are located in or on the outskirts of the city, agricultural production is still preserved in these gardens. Although some of these gardens are privately owned, many of the gardens today are managed by the

municipality and the Ministry of Cultural Heritage, Tourism and Handicrafts (MCHTH). This means that these sites can be used to familiarize people with the subject of agriculture. But from about 50 years ago onwards, looking to the historic green spaces such as the Persian Garden was more of a conservation approach, and the garden was protected not as a living thing but as an antique object [19]. This has caused the historic gardens owned by the municipalities and MCHTH to gradually lose their agricultural capacity [20]. Therefore, despite the becoming publicly accessible of many gardens, little attention is paid to the issue of production and agricultural economics in these gardens. In fact, ecosystem services of the Persian gardens as the multifunctional landscape has fluctuated over time due to management and maintenance conditions and the way the garden is viewed. Therefore, while the provisioning services of the Persian gardens are declining, the cultural services in term of recreation and tourism have been upgraded due to the opening of the garden to the people [21]. While the Persian garden in the past had a great variety of agricultural products (different types of fruits, vegetables and medicinal plants) [22], today the variety of products has decreased sharply and from the old generation of edible landscape only a few fruit trees remain [23].

As getting citizens to commit to gardening is not always easy [24], understanding urbanites' motivations helps landscape architects design gardens that encourage citizens to actively experience ecosystem services and contribute to the management of urban green spaces [25,26]. Therefore, the design creates a landscape that could be interesting not only for food production, but also for leisure, ecology, and water conservation purposes [27,28].

This paper focuses on the Persian garden as edible green infrastructure [29,30] that is preserved as historic property in many Iranian cities. Despite great efforts to achieve recognition of the Persian garden, this type of green heritage's role has not yet been explored in urban agriculture development. Interestingly, edibility and planting fruit trees constitute a notable element of these gardens [31,32], and they encompass some of the remnant urban agricultural heritage in Iranian cities, where historical value closely links urban gardening to cultural heritage. At present, the historical Iranian urban gardens are, in many cases, publicly accessible open spaces where users can interact, which enhances social inclusion [33,34]. However, conservative approaches involving rules and regulations aimed at defining and protecting urban historical gardens as permanent land use [19] do not guarantee farming activity [17]. Even though land preservation is a necessary component of master plans and other planning tools, it will not guarantee long-term agricultural activity [35].

Based on Wright et al. [36], the edible landscape is valuable for its stunning scenic quality, but society requires that these gardens be planned and operated as more than recreational resources. Thus, it is necessary to evaluate historical Persian gardens in cultural and geographical contexts that suffer from urbanization and the widening inequalities that exist in many Iranian cities in order to assess the gardens' suitability as a model for contemporary urban gardening, with the aim of encouraging users to get involved in agricultural activities.

Hence, this paper addresses the following main question: What role can be designated for the Persian garden in urban agriculture development? More specifically, the authors seek to answer the following question: Is the Persian garden's spatial and structural design appropriate for accommodating urban food gardening? Therefore, the prime objective of this paper is to compare and assess the appropriateness of the Persian garden's design, structure, and heritage for the development of urban food gardening, based on criteria derived from related multidisciplinary studies.

2. Theoretical Framework

2.1. Urban Food Gardening

Among the different types of urban agriculture, this paper focuses on urban food gardening, which includes agricultural activities with relatively low financial dependence on material outputs, while using what is produced to achieve other—mainly social and

cultural—goals [37]. In this regard, proper planning, design, and management are key to enhancing the well-being that urban gardens can deliver to society by maximizing accessibility and promoting fair harvesting [38]. While urban gardens provide social innovation [39–41] in addition to food, explorations of spatial quality and design guidelines in terms of garden architecture have received little attention [42]. Landscape architects are trained to design public spaces, but they often lack the experience to undertake the spatial design of a productive landscape [43]. An in-depth review of recently published scientific literature in the field of agriculture landscape revealed at least three major areas that determine the rules of edible landscape design, namely garden architecture health considerations [44–47], ecological considerations [48–52], and social and cultural considerations.

2.2. The Socio-Cultural Dimension of the Landscape Architecture of the Public Edible Garden

Urban food gardening provides opportunities to enhance community involvement, promote social interaction between communities, and catalyze community development [38]. Hence, designing urban agriculture greenery plays significant socio-cultural roles [53,54]. Morckel [55] proved that social functions and attractiveness direct design guidelines for community garden spaces. While the functionality aspect enables gardeners to conduct their activities, attractiveness ensures that garden and community space is aesthetically pleasing.

2.2.1. Functional Guidelines

Functional motivations such as the desire to produce fresh food, maintain personal health, and enjoy being outdoors have significant relationships with gardeners' intention to participate in community gardens [56]. Thus, well-designed edible community gardens might contribute to a secure food supply and provide necessary infrastructure that is designed with consideration to elements that promote social interaction and group gardening activities in order to enhance feelings of connectedness with nature, thereby reducing tension and stress [57]. Therefore, urban gardens' landscape architectural features affect community participation and activities at each site. Community orchards are generally managed with much less intensity than gardens and allotments; because of the comparatively minimal amount of landscape engineering, there may simply be less opportunity for physical activity due to their design. Community gardens and allotments combine designated edible gardening areas with common recreational areas and require higher levels of maintenance efforts. Therefore, incorporating multifunctionality and a greater degree of complexity in community garden design could significantly increase user participation [58]. Moreover, ensuring the presence of a sufficient number of well-appreciated and appropriately located specimens and species will ensure that public urban orchards have a positive impact [59].

According to Milburn and Vail's [60], Prové et al.'s [61], and Mack et al.'s [62] findings on the keys to community gardens' success included the following physical design considerations: proximity to users and accessibility, physical characteristics that support growing (solar gain, access to water and soil), a compact site (as opposed to long, linear sites), high visibility from the street and within the garden, and the inclusion of appropriate site elements for growing (including composting, storage, perimeter fencing, and a bulletin/message board). Although site access has been proposed as affecting the management of and sense of place associated with community-managed spaces [63], the data Dennis and James [58] have presented indicated that physical design could affect stakeholder involvement in urban gardening. Hou et al.'s [64] work on hybrid community garden and public space projects identified several important physical conditions for successfully designing production landscapes as public space, including improvements and adjustments made over time, the capability for incremental change, addressing user needs and sensitivity to the existing context, programs involving multi-use activities including non-gardening programs, and diversity and opportunities for artistic expressions.

Napawan [43] reviewed the literature specific to the development of urban agriculture projects, including communally-managed spaces, and classified the physical condition and spatial components into three predominant site criteria, namely site context, site perimeter, and site layout and design. Site context refers to the appropriate neighborhood context and pedestrian or transit site accessibility. Ease of site entry and visual connectivity are related to the site perimeter [3,35,65]. More importantly, the site layout and design criterion covers attributes such as flexible layout [17], within-site accessibility [33], site maintenance [45,66], flexible program opportunities [67,68], and the dual functions of urban farming and alternative recreational programs. This is done by separating production and public space functions [36,69], publicizing opportunities for nesting food production and public space programs to varying degrees [70,71], creating a central meeting spot [3,72], having an onsite gathering space [57], and cultivating hedgerow and installing raised planter beds [73,74].

Moreover, Francis and Griffith [75] introduced four design principles for designing farmers' markets in public space: wholeness, social life, flexibility, and design permanency. Regarding design permanency, landscape features (e.g., entry structures, gazebos, fountains, pavilions, and groves of mature trees) can establish garden permanency through design [54,76,77]. Flexibility refers to a resilient design that is adaptive and accommodating of work, allowing the space to adapt to seasonal variation and fluctuations [55,70,78]. In addition, the productive landscape must be simultaneously distinguished from and reflective of the adjacent urban context, demonstrating the importance of spatial consideration of the landscape's periphery [58]. Special design consideration should be given to supporting socialization by coordinating the promenade landscape with sedentary spaces; having adequate seating of both the fixed and movable variety; hosting a diversity of users in terms of age, gender, and social-cultural background; integrating children's play and activity needs into the design; offering social programs; and ensuring that the design process is participatory [15,34,40,54,68,79–86]. In this regard, Mangone et al. [87] have also suggested that urban gardens as natural open spaces that are viewed as highly flexible, multi-use spaces suitable for a diversity of activities.

Furthermore, access to diverse workspace types with different spatial qualities appears to be highly valued. This kind of structural complexity, which is associated with management intensity, offers a basis for greater volunteer involvement, well-being, and the generation of local biodiversity and associated ecosystem services [58]. Expanded management requirements also offer participation opportunities, and the resultant physical activity while engaging in horticultural and site maintenance promotes participants' health [88,89]. In turn, as Dennis and James [58] have demonstrated, site biodiversity grows in proportion to volunteer input, and given the primacy of horticultural activity in community-managed spaces, food provision productivity may also be a key gain of more intensively-managed communal spaces.

2.2.2. Attractive Features

While edibility has been mentioned as the primary function, recreation, connectedness to the natural environment, positive social interactions, education, and habitat value have also been discussed across different types of urban food systems with plants [68,90]. Thus, gardeners are not just driven by functional motivations; they are also motivated by the emotions they ascribe to the gardens and potentially impeded by conditional motivations [56], in which attractiveness plays a critical role [33]. Thus, the design side of urban food gardens aims to design attractive urban environments [27]. Additionally, Lee and Matarrita-Cascante (2019) showed that emotional motivation with respect to psychological connectedness with and appreciation of a garden composition and configurations that satisfy gardeners' demands and specific goals increases gardeners' intention to participate in gardening. Therefore, both functional connectedness with the garden and gardeners' appreciation of the attractions help establish a positive affective bond between gardens and citizens. Additionally, for an edible landscape, a structure must be adopted based on the

most influential gardening motives, among which aesthetics, shade, and deriving joy from the hobby [91] all demonstrate an attractive design's significance in promoting urban food gardening. More specifically, even minimizing the potential negative impacts of practical issues such as littering, maintenance, unequal sharing, and the potential presence of worms in fruit would affect whether public urban orchards flourish [59].

To provide insight into what can be done to improve green spaces in order to make them more attractive community assets year-round, the findings of previous researchers [20,23,32,33,35,55,92–95] revealed that the presence of each of the following features would be beneficial and effective: a focal point (such as a gazebo or an arch), fencing, plants arranged in rows, raised garden beds, formal landscaping (such as walkways), trees, decorative non-edible plants, and artwork. To increase gardeners' involvement, garden designers should promote gardeners' emotional attachment to their gardens, while decreasing the time required to manage them. In addition to offering a restorative environment in edible community gardens, Lee and Matarrita-Cascante (2019) argued that garden–user relationships could be improved by the establishment of shelter settings, walls of trees, or hedges between garden units to provide gardeners with quiet, cozy environments. Additionally, small zones would not only allow individual gardeners to leisurely cultivate vegetation and concentrate on their work, but also heighten gardeners' sense of personal responsibility to and ownership of their individual plot [96,97]. Thus, in the designs they produce, garden planners and designers must be capable of reflecting gardeners' motivations for sustained participation, while decreasing any obstacles to garden participation. Better garden designs, as Lee and Matarrita-Cascante [56] and April [53] have recommended, may bolster community gardens' long-term viability and contribute to the provision of more urban green spaces.

3. Materials and Methods

This study examines the existing physical features and functionality of Persian gardens to determine if these sites can play a role in providing utility to the urban environment. Persian gardens are historical examples of Iranian green landscapes that have established an intricate relationship with cities and become part of the public realm [98]. These gardens date back to the 6th century BC and were recognized as World Heritage Sites by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) in 2011 [99].

The approach of this research is primarily descriptive and is based on the investigation of purposive case studies [100,101]. In this research, we use multiple cases to build a logical base for a comparison framework. Persian historic gardens have been individually selected as purposive samples because their similar characteristics and authentic situations enable the authors to draw conclusions and generalizations based on the gardens' landscape type rather than their statistical occurrence.

Among several types of purposive cases, the authors selected paradigmatic cases [102], which, in this research, means Persian gardens as historic Iranian landscape exemplars with prototypical value. These were selected because the researchers believe that they represent a generally relevant situation. The conclusions yielded from the analysis of these prototypical cases using a descriptive-qualitative approach will be relevant to urban garden design. These purposive case examples all share a common feature, in that they each facilitate the investigation and comparison of a particular type of relationship. Though a very long time has passed since the construction of the Persian garden of Pasargadae in 6th BC, the Persian garden has kept its architectural and geometrical principles during history. The common feature of Persian gardens encompasses a unique geometry, design, and architecture. In more detail, all the selected gardens bear a rectangular form consisting of several planting beds, streams and pathways, ponds and fountains, a central pavilion, and the walls that surround the gardens [103].

Case study comparisons were undertaken at the cross-case comparison level because the researchers sought to answer questions by comparing different cases using guidelines extracted from the mentioned literature, in addition to performing cross-case comparisons.

As a first step, inferences from the literature enabled the compilation of criteria associated with the physical patterns of food production landscapes, which are also public spaces. These data gave the authors insight into the characteristics of the productive landscape of the Persian garden, its ability to create productive public spaces, the design of the site, and relevant issues in the design of urban food gardening at the site level (Table 1).

Table 1. Landscape design criteria for productive urban gardens based on socio-cultural considerations (drafted based on [62] p. 149).

Design Guidelines	Guideline/Feature	Design Feature
Functional guidelines	Site context	Appropriate neighborhood context Pedestrian and/or transit accessibility to site
	Site perimeter	Ease of site entry Visual connectivity
	Site layout and design	Flexible layout and program opportunities Within-site accessibility Adaptive to alternative recreational programs Separating production from public space functions A central meeting spot An onsite gathering space Hedgerow and raised planter beds
	Permanency of design	Entry structures, bandstands, gazebos, fountains, market pavilions, groves of mature trees, socially interactive plazas, pedestrian-scaled lighting, and thematic gardens
	Flexibility	A resilient design Adaptability to seasonal variation Market patronage
	Wholeness	Physically: 1. Distinguished from the urban context 2. Reflective of the adjacent urban context 3. Spatial consideration of the periphery landscape Planning and maintenance: 1. Encourages communities to engage with the garden program
	Social life	More spontaneous public space Adequate seating Encourages visits from people who are diverse in terms of age, gender, and cultural background. Integrates children's play Social programs Participatory design process
Attractive features	Focal point	Includes a gazebo or arch
	Fencing	Clearly defined boundaries—e.g., a wall
	Plants arranged in rows	Planting edible plants based on a linear system
	Raised garden beds	Gardening availability for children, the elderly, and the disabled
	Formal landscape design	Walkways
	Integration of conifers	Planting a variety of pine and cypress trees
	Non-edible plants for decoration	Decorative plants
	Artwork	Historical/traditional decorations

In the second step, the information and guidelines gleaned from previous scholarly works helped us to orientate site observation work and to begin suggesting the how and why of the Persian garden landscape as a location for the development of urban gardening, rather than merely looking at the cultural heritage. All-important early research works were identified and helped us to develop an understanding of the landscape's socio-cultural appropriateness. Field studies were conducted in the summer of 2020. These involved qualitative analyses using a thematic case study methodology to assess the appropriateness of the structure of historic gardens according to the socio-cultural guidelines derived from our literature review.

The field study methods used (onsite mapping, observation, photography) were adopted in all the cases under investigation to identify the specific tangible landscape characteristics capable of creating collective landscape gardening. These components include circulation networks, spatial arrangements, buildings and structures, vegetation, boundaries, small-scale elements, and views and vistas. In the evaluation of the gardens based on the gathered criteria, three methods were used for evaluation. In the case of visual phenomena (such as plants), the presence/absence of the phenomenon was examined through field surveys. Regarding the structural dimensions of gardens (such as the circulation system) its functionality or non-functionality was evaluated. On non-structural and intangible dimensions (such as social life) both through garden visits and non-structural interviews with some gardens managers, the interaction of visitors with the gardens were assessed.

In the third step, we sought to fully understand the cultural landscape through its inherent tangible value and establish its significance as a guide for conservation and future sustainable use in the field of urban gardening. Theoretical collections, field surveys, and assessments of the heritage that created the landscape formed the basis for the understanding of its gardening value. The evaluation of the Persian gardens as a potential site for urban gardening development involved synthesizing information gleaned from the research and analysis of tangible data to develop a clear understanding of how and why these historic sites are appropriate locations for the future of urban agriculture in Iran. Through this endeavor, we produced a statement of the significance of each garden and an overall statement regarding the collective value of the studied gardens.

Case Studies

Table 2 shows the selected case studies—namely, the Akbarieh, Chehel Sotun, Dolat Abad, Fin, Pahlavanpur, and Shahzadeh gardens. These gardens are registered as World Heritage Sites by UNESCO and nested in different provinces of Iran. While Akbarieh is located in the central east of Iran (Birjand), Chehel Sotun (Isfahan), Dolat Abad (Yazd), Fin (Kashan), Pahlavanpur (Mehriz), and Shahzadeh (Mahan) are in the central provinces (Figure 1).

The six selected gardens, which together represent the outstanding features of the Persian garden, are managed under the supervision of the Iranian MCHTH. The existing management system considers the preservation and management of all the gardens while maintaining their authenticity and integrity and aims to preserve the outstanding overarching features of the Persian gardens.

From the agricultural point of view, the situation of these 6 gardens is different. Akbarieh, Pahlavanpur and Shahzadeh agricultural landscapes, mainly including native fruit trees (such as pistachios, pomegranates, berries, apricots and almonds) are preserved. But in Dolat Abad and Fin gardens, the agricultural landscape is being revived and doesn't yet bear a significant amount of fruits. Although Chehel Sotun Garden had an edible landscape in the past, today most of its greenery is decorative. The destinations of fruits produced in the mentioned gardens are different. In Akbarieh, Shahzadeh garden the edible products are distributed amongst or sold to the garden administration and workers. Pahlavanpur is a privately owned garden, thus the edible products is sold to the local market [18].

Table 2. Detailed information about the studied Persian gardens in Iran [65], (p. 4).

Ownership	Protective Designation	Area (ha)	Geographical Coordinates	Province/City	Number and Name of Garden
Endowment	1999	3.40	N: 32°51′10″ E: 59°13′40″	Southern Khorasan/Birjand	1—Akbariyeh
State property	1932	5.80	N: 32°39′27″ E: 51°40′51″	Isfahan/Isfahan	2—Chehel Sotun
Endowment	1967	8	N: 31°54′12.30″ E: 54°21′6.59″	Yazd/Yazd	3—Dolat Abad
State property	1935	7.60	N: 33°220′20.53″ E: 51°22′20.53″	Isfahan/Kashan	4—Fin
State property	2003	3.50	N: 31°54′12.30″ E: 54°21′6.59″	Yazd/Mehriz	5—Pahlavanpour
State property	1975	5.50	N: 30°01′30″ E: 57°16′59″	Kerman/Mahan	6—Shahzadeh

Figure 1. Location of the studied Persian gardens in Iran (1: Akbarieh; 2: Chehel Sotun; 3: Dolat Abad; 4: Fin; 5: Pahlavanpur; 6: Shahzadeh). Source of map: https://commons.wikimedia.org/wiki/Atlas_of_Iran#/media/File:Iran_2001_CIA_map.jpg (accessed on 8 November 2021), (the locations of the gardens were added by the authors).

4. Results

The existing elements of Persian gardens can be divided into two groups—namely, natural elements (soft landscape—e.g., trees and water) and artificial elements (hard landscape—e.g., pavilion, walls, paths. and entrances)—which together can play an important role in the creation of urban food gardens, both functionally and aesthetically. Accordingly, the relationship between each garden case's components and urban food gardening development can be described as follows (Table 3) based on the guidelines mentioned in Table 1. Based on the results of this study and the evaluation of the authors of this article, the studied gardens in terms of socio-cultural appropriateness for the development of urban agriculture, in each item had one of these three conditions:

- presently accommodated: currently, the garden has this criterion or element.
- cannot be accommodated: currently, the garden has not this criterion or element, and even in the future this item can not be executed in the garden due to the restrictions forced by laws or the limitation imposed by the garden structure and design.
- potential future accommodation: currently, the garden has not this criterion or element, but in the future this item can be executed in the garden.

Table 3. Socio-cultural appropriateness of the Persian Gardens for productive urban garden development (✓✓: presently accommodated; ×: cannot be accommodated; ✓: potential future accommodation).

	Appropriateness					
	Akbarieh	**Chehel Sotun**	**Dolat Abad**	**Fin**	**Pahlavanpur**	**Shahzadeh**
Site context	✓✓	✓✓	✓✓	✓✓	×	×
Site perimeter	×	✓	×	×	×	×
Site layout and design	✓✓	✓	✓✓	✓✓	✓	✓✓
Permanency of design	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Flexibility	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Wholeness	✓	✓	✓	✓	✓	✓✓
Social life	✓✓	✓✓	✓	✓✓	✓	✓
Focal point	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Fencing	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Plants arranged in rows	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Raised garden beds	✓	✓	✓	✓	✓	✓
Formal landscape design	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Integration of conifers	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Decorative plants for embellishment	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
Works of art	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓

4.1. Akbarieh Garden

It is nested adjacent to the urban neighborhood context in Birjand city. Indeed, according to several onsite observations and interviews with the garden manager, most visitors are attracted to the south side of the garden, which is the pleasure landscape. On the other hand, based on the basic garden layout, the garden's elongated north side is dedicated to agricultural production. Accordingly, the pleasure landscape and production landscape are separated from each other (Figure 2).

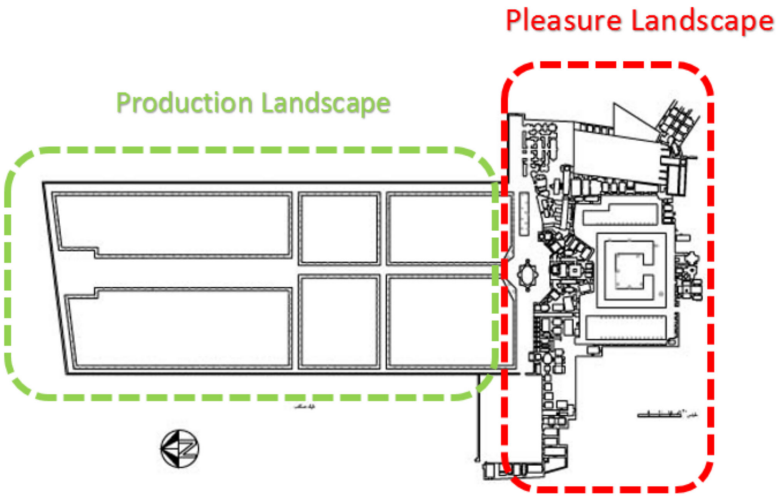

Figure 2. Separation of the production landscape from pleasure landscape in Akbarieh garden meets the functional appropriateness of this garden for development of urban food gardening.

The two-story historic monument is the garden's central focal point, as the recessed façade creates a welcoming atmosphere and encourages an appreciation of the building's glory, given that the main portico draws attention to the skyline. Behind this central building is a yard of about 3000 square meters where a horseshoe-shaped pool, surrounded by pine and mulberry trees, makes this area the recreational space of the garden.

As Figures 3 and 4 show, Akbarieh enjoys a wide variety of plant species, including fruit-bearing trees (Pistscio, apricot, pear, white mulberry, fig, pomegranate, barberry) alongside tall, old, evergreen coniferous decorative pines and cedars (Pinus eldarisa, Thuya orientalis, Cupressus Sempervirens). In the garden, the planting layout is such that pine tree rows run along the longitudinal axis in a north-to-south direction. On either side of this axis, there are six symmetrical planting plots allocated to food trees. At present, gardening affairs are the responsibility of the garden body management, which comprises part-time and full-time employees.

(**a**) (**b**) (**c**)

Figure 3. *Cont.*

(**d**) (**e**) (**f**)

Figure 3. Integration of fruit-bearing trees in Akbarieh garden as functional urban food gardening tools. (**a**) *Ficus carica* (Fig), (**b**) *Punica granatum* (Pomegranate), (**c**) *Prunus armeniaca* (Apricot), (**d**) *Pistacia vera* (Pistachio), (**e**) *Morus alba* (White mulberry), (**f**) *Berberis vulgaris* (Barberry).

Figure 4. Pistachio trees in Akbarieh garden.

Since the garden is situated in one of the driest areas of eastern Iran, the prime utilization of water here involves irrigating the garden's lush vegetation to nurture a lovely, refreshing environment.

4.2. Chehel Sotun Garden

This garden is located in the Isfahan urban context and is accessible to visitors via several peripheral pedestrian walkways. The garden is surrounded on all four sides by a brick lattice wall, which separates the grounds from the surrounding area to improve care and maintenance. Thus, from the peripheral streets and walkways, pedestrians enjoy visual connectivity with the garden scenery, but transit accessibility is only possible through a specific entrance gate.

At present, the Chehel Sotun garden reflects the attractiveness of Persian gardens, where vegetation, water, and architecture coexist to create a pleasant, relaxing historic garden. Its vegetation comprises many trees and shrubs, most of which are decorative

trees (such as Pine, elm, maple, and sycamore). Unlike the other Persian gardens, this historic landscape does not accommodate fruit-bearing plants or an agricultural landscape (Table 3).

A grid-like access network facilitates access to the site via the main axes of the garden, which run east–west and along which plane trees are planted to connect the entrance and the central palace. The most important feature of the garden at Chehel Sotun is the long pool opposite the historic palace. The pool is closely related to the prestigious palace. Together, they serve as the central meeting spots, where many visitors gather. Social life flourishes around this pool due to the presence of shade casting-trees, a comfortable thermal environment, adequate seating, and visually delightful scenery, all of which encourage visits from people who are diverse in terms of age, gender, and cultural background.

4.3. Dolat Abad Garden

This garden is located in the urban fabric of one of central Iran's biggest cities, Yazd. In the garden of Dolat Abad, there are many trees, mainly pines, cedars, and fruit trees. The fruit trees include vines and pomegranates, which are planted in specific plots. The pines are in two rows along the main axis of the garden, which lies between two pavilions.

The oldest tree of the garden is an ancient mulberry tree that is located along the main entrance path. The garden consists of seven main beds separated by water streams; special food trees (pomegranate, fig, olive) are planted in each bed (Figure 5). In the western area, opposite the winter mansion, an exotic palm tree stands out among the other trees.

Figure 5. Edible landscape of Dolat Abad garden.

Other prominent features of the garden at Dolat Abad include the historic long pond and the several streams that flow through the garden area. The other notable element at Dolat Abad in terms of spatial structure is the strong east–west axis that separates the agricultural plots from the central promenade.

On the east side of the garden, the hexagonal porch is a traditional architectural element that attracts the attention of visitors. This two-storey building is located on the main axis of the garden and serves as a central meeting point, as it acts a reception and resting place for visitors. Considering that there are several buildings and water basins, as well as several streams, former stables, and servants' quarters, the garden reflects the permanent design and spatial elements that are prerequisites for the development of the urban garden. Table 3 briefly describes the suitability of the Dolat Abad World Heritage Garden for the development of productive urban gardening from the perspective of social and cultural guidelines.

4.4. Fin Garden

The Fin garden is located in the Kashan urban setting and is understood today as a tourist historic garden mainly by virtue of its plants, particularly its cedar trees, as well as its water circulation system, grid pedestrian network, and prestigious historic architectural monuments. The garden is enclosed by a high wall and the garden area is accessible via a specific entrance, which is the first structure that comes into view when approaching the garden from the peripheral street.

In addition, there are seventeen large planting areas in the Fin garden, the edges of which are lined with cedars, while insides are planted with trees that produce various types of fruit, such as figs, mulberries, pears, pomegranates, willows, quinces, greengage, and apricots (Figure 6). Therefore, unlike the Chehel Sotun garden, this historic landscape hosts urban gardening, albeit within the framework of the governmental agency of the MCHTH.

Figure 6. Maintenance of food trees in the Fin garden.

The presence and distribution of water at different levels and in all nooks and crannies of the garden not only enhance the visual scenery and increase the local humidity and coolness, especially in the warm seasons, but also support the thriving social activity taking place in the garden (Figure 7).

Considering the fact that the spatial structure of the Fin garden has two intersecting axes, which are considered to be important for the formation of the general space, and that the central pavilion serves as a focal point and gathering place, the layout and design are suitable for the development of the urban garden (Table 3).

The beautiful ornamental trees and shrubs in this garden contribute to the aesthetic value of the garden from the visitors' point of view, as the arrangement, configuration, order, and composition of the trees, flowers, and shrubs in the garden follow the principles of social farming.

By separating edible trees (planted in square plots) from non-edible and ornamental plants (planted in rows around walkways), the garden enjoys a high degree of legibility—a feature that is potentially important in the creation of attractive and functional urban garden spaces (Table 3).

Figure 7. Functional and attractive water features in Fin garden, especially as tools for supporting social life.

4.5. Pahlavanpur Garden

Pahlavanpur garden is a green complex comprising of a natural product garden and a promenade lined with and concealed by tall plane trees. Considering that a Qanat (an antiquated arrangement of underground channels developed to ship water from the inside of a slope to a town lying beneath it) goes through it and because of its moderate climate, the garden features rich vegetation, which draws in an enormous number of tourists from Mehriz and Yazd. Due to the garden's rural setting, the authors explore its inward properties to present this world heritage site as a model of urban edible gardens.

Pahlavanpur has a linear system of different trees, which are generally pines, cedars, and organic product trees. Organic product-bearing trees in the garden include fig and pomegranate trees planted in the agricultural areas (Figure 8). Plane trees are planted in two lines along a couple of streams; these create a healthy, attractive atmosphere. Thus, there is distinct separation between the utilitarian and recreational landscapes in this garden (Table 3).

Figure 8. Edible landscape of Pahlavanpur garden.

4.6. Shahzadeh Garden

While the garden is not part of the urban fabric and consequently does not meet the functional guidelines for urban gardening development since it is not situated in the appropriate neighborhood context, its layout and design satisfy the mentioned criteria (Table 3). Shahzadeh is an exemplar of terraced Persian gardens. Shahzadeh garden was designed to incorporate innovative irrigation measures that not only water the whole garden, but also integrate the emotional sensoria of water into the historic landscape. For example, the Baroque organizations of water cascades orchestrate a central water stream in the garden. In addition, blending nine fountains and nine cascades in this green space makes the Shahzadeh garden one of the most artistic manifestations of oasis gardens in Iran.

The linear spatial structure of the garden is emphasized by the plane and cypress trees planted along the central walkway and the stream running along it, which are formal landscape elements that facilitate walking, gathering, sitting, and photography (Figure 9).

The garden's vegetation follows a completely regular symmetrical design. The garden's tree planting design and appropriate plant selection are significant factors in creating shade and displaying the various colors of the different seasons, both of which contribute to a varied, visually interesting landscape. Planes and cypresses planted along the garden's central axis cast shadows on the walkways. Moreover, a wide variety of fruit trees, such as grape, apple, pear, apricot, pomegranate, quince, peach, and black plum trees, are planted in specific planting beds (Figures 10 and 11).

More importantly, as Figure 12 depicts, the productive landscape is separated from the central promenade, revealing that this landscape's layout and design can be considered as a prototype for designing future multifunctional edible urban gardens (Table 3).

4.7. A Comparison of the Cases

4.7.1. Site Context and Perimeter

With the exception of the Shahzadeh garden, which is located on a desert bed in the middle of an inter-city road, and the Pahlavanpur garden, which is located in a rural area, the other gardens are situated in an urban context where citizens live close to the garden. Even the Shahzadeh and Pahlavanpur gardens, despite their non-urban locations, have structures and spatial systems that, as described, are favorable for the development of civic gardening or can be regarded as a prototype for designing the new generation of urban edible gardens

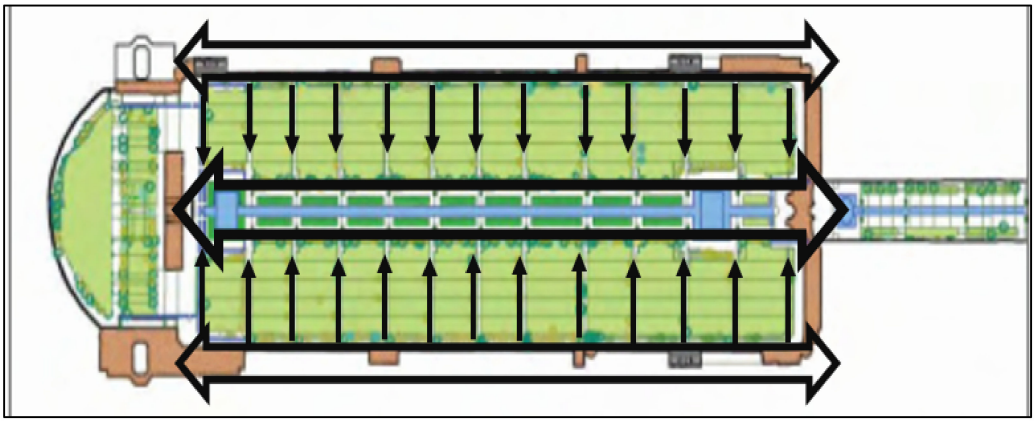

Figure 9. The functionality of the circulation system in the Shahzadeh garden as a means to make the whole garden accessible and attractive to public visitors.

Figure 10. New planted food trees in Shahzadeh garden.

Figure 11. Traditional framework for growing grapes in Shahzadeh garden.

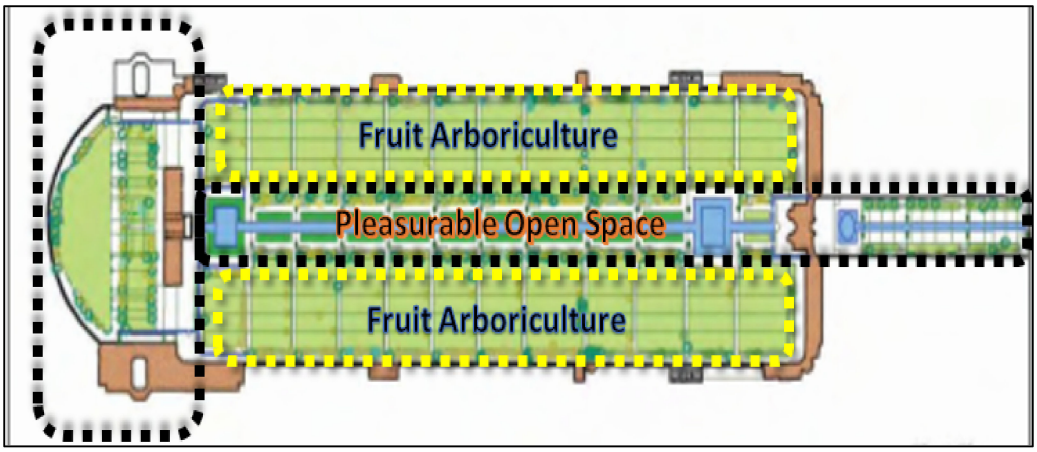

Figure 12. Separating production (yellow dashed line) from recreation (black dashed line) functions in the Shahzadeh garden as part of the basic site layout.

All the studied gardens have a perimeter wall; therefore, the only way to enter the garden is through a marked entrance that leads people into the garden. There are some differences between the studied gardens. For example, the Chehel Sotun garden has a lattice brick wall that allows people to see the garden's interior from the sidewalk. However, the other gardens have a solid brick wall that does not allow citizens to view the garden's interior from the outside. Although garden walls provide security and privacy, walls are problematic for urban gardening because they prevent people from visually connecting with the agricultural activities inside the garden. However it secures the garden's edible products.

The garden space's entrance structure catches visitors' attention with its geometrical features and traditional decorations. The Fin and Shahzadeh gardens have a ceremonial entrance as part of a a two-storey building, while the Pahlavanpur and Akbarieh gardens just have a simple gate. "Entry structures and ease of site entry are mentioned as requisite characteristics of a collective productive site" ([62], p. 159). Nevertheless, in some cases, such as in the Chehel Sotun and Fin gardens, visitors must pass through a series of hierarchically organized entrances to enter the main garden area. While the hierarchical access offered by Persian garden features may be appealing to visitors, it can be tedious for urban gardeners who must be constantly on the move. Some gardens, such as the Akbarieh garden, have side entrances that are closer to the productive landscape for the exclusive use of urban gardeners.

4.7.2. Site Layout and Permanency of Design

From the perspective of urban gardening, the most important structural feature is the separation of agricultural space from recreational space so that agricultural activities do not hinder recreational use and vice versa (Figures 4 and 10). Next, the existence of a fixed access network in the gardens, the separation of access paths to the main and secondary paths, and the existence of a central axis in each garden per formal landscape design allow people to access different parts of the garden and use different paths for a variety of purposes.

Moreover, the mansion has a significantly eye-catching frontage; thus, it can serve different basic functions in terms of envisioning urban gardening (Table 4). Generally, the mansion is surrounded by open spaces, making it the central meeting area as well as the gathering place for the community of gardeners.

Table 4. Persian garden's hard landscape elements' role in accommodating urban gardening [62], (p. 156).

Design Guidelines	Specific Guideline	Role of Architectural Heritage in Urban Gardening Development in the Persian Garden
Functional guidelines	Site perimeter	Ease of site entry due to a distinct entrance to the Persian garden.
	Site layout and design	Accessibility within the site via the permanent circulation system. Alternative recreational programs offered because of the existence of architectural heritage and non-agricultural spaces. Separation of production from public space functions. Pavilion as the central meeting spot. Onsite gathering space around the pavilion.
	Permanency of design	All the architectural features (pavilion, buildings, wall, entrance, walkways, canals, pools, and gazebos) in the Persian garden are permanent.
	Flexibility	Consideration of a resilient design, the regional climate, and adaptability to seasonal variation in the Iranian traditional landscape architectural heritage.
	Wholeness	The gardens' historical environment distinguishes them from the urban context.
	Social life	Seating facilities in the garden. The garden is notable among citizens as a site of cultural heritage. Architectural spaces (indoor and outdoor) for holding urban food gardening participatory events.
Attractivefeatures	Focal point	Mansion and pavilion as the focal points.
	Fencing	Persian garden wall system.
	Formal landscape design	Walkway on the main axis.
	Artwork	Traditional decorations on buildings, walkways, entrances, and outdoor furniture.

The next piece of architectural heritage in the studied gardens is the geometrical circular walkway, which provides wonderful opportunities for visitors to see all the sections of the garden (Figure 9). As the access network, the circular system plays an important role in introducing public visitors to historic urban gardens' agricultural identity and capabilities. Urban dwellers will feel an attachment to urban gardens if they can see and use them while engaged in gardening activities [35]. The Persian garden's access network is designed to welcome visitors without creating conflict with the garden's agricultural use (Figure 9). Beyond the main axes, a pre-existing agricultural road system provides the basic structure; this has been adapted to accommodate a variety of different uses [17]. Furthermore, special paths could be created to help guide visitors. The design of existing paths could also be transformed to provide adaptability to multifunctional uses, or new connections could be inserted into the existing circular system.

4.7.3. The Persian Gardens' Attractiveness

Among the attractive natural features of the garden landscape, water and plants can play vital roles in envisioning urban gardening in a Persian garden.

Based on the data presented in Table 5, water can play irreplaceable function in encouraging urban dwellers to get involved in the Persian gardens with the aim of urban food gardening. Firstly, the water features act as focal point and, in combination with the architectural monuments, enhance the attractiveness of the site. Secondly, the presence of ornamental non-edible plants beside the streams (in the Pahlavanpur, Fin, and Shahzadeh

gardens) or other water surfaces (in the Dolat Abad and Chehel Sotun gardens) increases these historic gardens' palatability. Thirdly, the other aspect of water's potential to enhance attractiveness is the landscape architects' experimental use of water to showcase artwork. On the other hand, due to the variety of different visitors (in terms of age, gender, and cultural background) attracted to water-related features, the Persian gardens can be said to strengthen the social ties between people (Figure 7). "Thus, offering alternative recreational programs, having an onsite central meeting spot and gathering space, and integrating children's play are all conditions of the edible public landscape that can be furnished by the presence of water in traditional gardens, allowing us to reuse those gardens to enhance urban agricultural sites" ([62], p. 162)s.

Table 5. Significance of water features in envisioning urban gardening in the Persian garden (drafted based on [62] (p. 161)).

Design Guidelines	Specific Guideline/Feature	Role of Water Features in Urban Gardening Development in the Persian Garden
Functional guidelines	Site layout and design	Alternative recreational programs offered due to the various water features. A central meeting spot around the garden's main pool. An onsite gathering space around the water features.
	Permanency of design	Permanency of the fountains', streams', and pools' position and structure.
	Social life	The attractiveness of the water features facilitates the accommodation of visitors who are diverse in terms of age, gender, and cultural background. Integrating children's water play. Water-related social programs offered.
Attractive feature	Focal point	Pools, streams.
	Formal landscape design	Stream in the middle of the main axis. Water features around or in front of the mansion.
	Artwork	Cascading water in Shahzadeh garden. Water jets in the Fin garden.

But an important issue regarding the role of water in improving the production capacity of the studied gardens is the water crisis in Iran. It is interesting that the gardens of Fin, Shahzadeh and Pahlavanpur do not suffer of water shortage due to the abundant water of the aqueducts, so the strong and effective presence of water in these three gardens is quite tangible. But the gardens of Akbarieh and Dolat Abad are facing a water shortage crisis. In these gardens, the problem can be solved to some extent by upgrading traditional irrigation systems and replacing it with drip irrigation. But it should also be noted that the role of gardens as a bed of social food landscape is not just to increase productivity capacity. In fact, the involvement of urbanites into these gardens as urban gardeners does not necessarily mean an increase in planting volums, but citizens can participate in the maintenance of existing fruit trees or receive horticultural and agricultural training as discusses by [49,104,105]

The current plants in the studied Persian gardens can be categorized as conifers such as pines and cypresses; shading trees such as plane trees; decorative bushes and flowers such as Pyracantha, Juniperus, and Cotoneaster; and edible-bearing trees such as apple, apricot, quince, and peach (Figures 3 and 4), except in the Chehel Sotun garden, which cannot accommodate fructiferous vegetation.

From the perspective of the functional guidelines, as decorative vegetation is planted beside walkways in a manner that is compatible with the garden layout, the plants positively affect within-site accessibility. Additionally, positioning attractive plants alongside

the garden's pedestrian networks and around the main building supports alternative recreational programs beyond agricultural activities. Moreover, the productive landscape is divided from the pleasure landscape, an aspect that has been pointed out by previous researchers [43,106,107] as a basic guideline for designing food gardens, and this strategy has been applied in all case studies (Table 6).

Table 6. Plants' functional and attractive role in realizing urban gardening in the Persian garden (drafted based on [62] (p. 168)).

Design Guidelines	Specific Guideline/Feature	Role of Green Heritage in Urban Gardening Development in the Persian Garden
Functional guidelines	Site layout and design	Separation of production from non-agricultural space. Guiding the visitor to the central spot by planting structural plants.
	Permanency of design	Groves of mature trees. Thematic gardens such as fruit, medicinal, and indigenous gardens.
	Flexibility	Implementing a resilient design by utilizing resistant indigenous species. Adapting to seasonal variation by utilizing the appropriate indigenous plants.
	Wholeness	Distinguished from the urban context due to agricultural scenery.
	Social life	Accommodating visitors who are diverse in terms of age, gender, and cultural background due to the production of a variety of fruits. Integrating children's play in agricultural ceremonies. Social programs related to gardening and production. Participatory process for collective gardening.
Attractivefeatures	Fencing	Huge vegetation on the garden's periphery. Dense planting along the axes.
	Plants arranged in rows	Ornamental planting in rows around the axis. Planting fruit-bearing trees in rows.
	Non-edible plants for decoration	Existence of a variety of flowers, ornamental bushes, and trees.
	Formal landscape design	Formal landscape design along the main axis, around the mansion, and in the private yards.
	Integration of conifers	Planting pine and cedar trees.

5. Discussion

This paper started with this main query that how can the components of the Persian gardens allow the development of urban food gardening in the located Iranian urban or peri-urban areas? We surveyed six UNESCO registered gardens in Iran to assess the adaptability of them with the guidelines of designing the urban food garden, both functionality and attractiveness. While the attractiveness of Persian garden as a beautiful landscape which can prepare the cultural ecosystem services was previously well discussed [11,33,108–110], the authors viewpoint of this paper to the garden aesthetics was focused on preparing a basement for implementing the public-involving strategy in development of urban agriculture [95], since aesthetic value often attract many citizens, creating additional benefits for food urbanism [95,111]. In this approach, the Persian garden is assessed to accommodate a diverse range of ecosystem services, both provisioning and cultural ecosystem services. Thus, despite the current perspective that defines the historic gardens as cultural landscapes

where the architectural and vegetation monuments were embraced merely for the aim of attracting tourists [112,113], the garden attractive features also prepare the fundamental component of urban food gardens [114,115]. Many landscape features, such as channels, fountains, and planting systems, have been restored and preserved to make Persian gardens appropriate open spaces for offering cultural services [21]. However, beyond a beautiful landscape, the Persian gardens also accommodate a productive landscape that produces food. Such gardens (e.g., Rahimabad garden in Birjand city) can potentially produce about 4000 kg/m^2/year of fruit and vegetable crops [18]. At present, some of such agricultural lands are vacant (in Akbarieh and Dolat Abad) or have been repurposed as beautiful landscapes (in Fin and Chelesotun). Thus, the development of urban gardening on these kinds of landscape heritage allows many people to recognize urban gardening as a meaningful way to engage with the urban food movement [81,116–119].

As mentioned previously Iran's MRUD announced the plan "DUAP" which emphasized the role of urban gardens in the development of urban agriculture in Iran. But this contrasts to the Iranian mission to protect historic gardens and landscapes as the antique objects, so maintaining or reintroducing the agricultural capacities of the historical gardens is not a priority. Since availability and access to productive land are crucial for urban agriculture [120], a program promoting the creation of productive open spaces in these gardens should be launched with the participation of educational farms, farmers' markets, and food activists under plan of DUAP.

As detailed characteristics of the Persian garden designs presented in this paper, drawing citizens to these types of edible landscapes will not disturb their current recreational and official functions, since the spatial separation between utilitarian agricultural space and pleasure landscape. Additionally, we can hypothesize and further investigate whether creating opportunities for public engagement will enhance the preservation of the other garden functions, as the garden will be moved from the margins into the heart of the urban living, work, education, training, and feeding environment.

Creating mutual respect between the different users of these gardens is another goal of food urbanism and means reducing disagreement between agricultural productivity, ornamental greenery functions, and human use of the garden [121]. So that the character of the heritage gardens goes beyond their historic meaning, since the garden has become a means of involving urban dwellers in production activities. The authors of this paper explained the potential of the Persian garden in creating opportunities for public engagement in urban food gardening. More than producing food stuffs, approaching the Iranian historic gardens as hub for the integration of different programs, whether organic gardening, commercial agriculture, educational activities, or therapeutic visiting, can be regarded a basic factor making the garden a successful place where people can have positive experiences experience [122]. From this perspective, the Iranian historic landscapes are regarded as a place for the integration of different urbanites, attracting people to view the aesthetic elements and attributes of these gardens. Based on this strategy, the traditional agricultural utilities of these gardens are enhanced by their historical elements and the production of agricultural goods through contacting urban citizens who can engage in co-production programs or simply consume products from a well-known landscape heritage.

We spoke of the opportunities accommodating in the Persian gardens for the aim of urban gardening. But there are still some important challenges which would act as the barrier of our hypothesis. Firstly, the viewpoint and MCHTH administration to the Persian garden as a cultural landscape demonstrated the authority concern about the conservation and protection of the gardens [20,34,123]. Therefore, as long as historic gardens are managed under such limited thinking, citizens will not have a role in re-planning gardens with an urban gardening development approach. The second challenge is the absence of the Persian garden brand in the food products of Iran's domestic and export markets. Many of the fruits produced in Iranian gardens are consumed by the staff and visitors of the garden or put up for auction by the authorities. Therefore, considering the importance of branding in the development of green businesses and agricultural economy, garden

branding can strengthen the motivation to revive urban gardening [124–127]. The third challenge is how to maintain the traditional planting system in the process of developing social gardening in gardens. Historic gardens have certain plant species that are planted under the traditional planting system. However, urban agricultural activists may be interested in planting new plants and cultivars in historic gardens [128–131]. Of course, with the emergence of crises such as water scarcity and climate change [132], it is predictable that the Iran's MCHTH will have to replace some hydrophilic plant species with low-consumption cultivars. It should also be noted that traditional planting systems and native garden trees can be used as live classes, a platform for traditional gardening education for those interested urbanites [17]. Moreover, traditional planting systems and native plant cultivars are currently being regarded as a model for development of urban edible landscape such as development of urban agriculture in urban parks [13,14]. Thus, the Persian historic gardens can be regarded as a vanue for traning the landscape architects on the traditional system of edible landscaping.

6. Conclusions

In the Iranian urban context, a growing number of social, environmental, and economic problems are associated with great challenges such as food poverty, environmental injustice, and socio-cultural isolation. However, some areas of spatial heritage, such as the Persian gardens, can be planned and programmed with the view to developing new strategies promoting the multifunctional use of urban historical gardens. In this study, the authors' focus was on the following question: beyond accommodating historical elements architecturally and in terms of landscape architecture, does the Persian garden heritage have the potential to facilitate the development of urban gardening programs? From the perspective of urban gardening, citizens can be welcomed into historical gardens as food activists. On the one hand, the agricultural heritage features are still visible in the shape of Iranian gardens that are situated adjacent to residential neighborhoods. In addition, these historic landscapes encompass characteristic elements and traditional design features that could satisfy the guidelines that determine socio-cultural appropriateness for urban gardening. Astonishingly, in addition to having great cultivation potential and meeting the basic spatial requirements for developing urban gardens, the Persian garden's hard and soft landscapes are suitable for accommodating collective gardening activities. Therefore, from the socio-cultural perspective, the Persian garden is highly suitable for the development of urban food gardening.

Formal landscape design and the presence of non-edible decorative plants and traditional artwork increase Persian gardens' attractiveness in the context of the collective productive landscape. With their multifunctional spaces and tangible heritage, historical gardens are appropriate urban spaces for organizing multi-use programs. As a paradoxical fact, the wall frame impedes visual contact between the inside and outside of the garden while at the same time providing environmental security. Moreover, there are supportive and encouraging attributes in these gardens, including the separation of agriculture areas from pleasure landscapes and some public meeting spots, which enhance the potential of the Persian garden to attract diverse urbanites without disrupting gardening activities. Above all, the Persian garden's beauty, freshness, exceptional greenery, and health benefits are a testament to the historic achievement of designing a multifunctional landscape that can provide urban gardeners with an aesthetically pleasing experience.

If urban agriculture were implemented in Persian gardens, there would be an increase in ecosystem services such as provisioning and cultural services Possible contribution of urban agriculture in enhancement the provisioning services includes providing food, fibers and biomass, beyond enhancing pollination [30,133]. Moreover, investment of food activists in agricultural enterprises locating in historic landscape would contribute to the employment the labors as the current crises in Iran is high rate of unemployment. As in other parts of the world, local environmental associations, co-operatives, or non-governmental organizations (NGOs) could manage these historic gardens for the production of vegetables and

fruit (for example like urban agriculture within the Archaeological Park of Pontecagnano in Italy that is managed by a local association [134]. Such organizations, in partnership with local authorities, might develop rules for access, as well as guidelines for implementing biodiversity-based urban agriculture to maximize ecosystem services.

One of the most important results of this research is that even if in the future managerial or conservation barriers hinder the full realization of urban agriculture in historic gardens, these gardens can be regarded as design model for landscape architects who seek to realize the edible landscape ideas in the Iranian context. Furthermore, citizens who are looking to build a productive personal garden can also embrace fundamental concepts of the Persian gardens. Thus, these gardens can also be regarded as a teaching resource and natural laboratory.

Additionally, since this is the first time such an approach to the Persian garden has been proposed, it is necessary to conduct additional research to assess the adaptability of intangible (maintenance and laws) dimensions of the Iranian garden for the development of urban agriculture. We recommend that future research investigate Iranian urban dwellers' preferences for and perceptions of participating in developing urban agriculture as urban food gardeners at specific Persian garden sites. Subsequent research can also explore government agencies' approaches to the development of urban gardening in the Persian garden context.

Author Contributions: Methodology, M.R.K.; original draft preparation, M.R.K., M.A.-B.; analysis, M.R.K., M.A.-B. and A.R.; writing—review and editing, M.R.K., M.A.-B., A.R., G.X. and Q.Y.; conceptualization, M.R.K.; validation, G.X. and Q.Y.; funding acquisition, G.X. and M.A.-B. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Strategic Priority Research Program of Chinese Academy of Sciences, grant number XDA2002040203; National Key Research and Development Plan, grant number 2016YFC0503403 and 2016YFC0503706; Fundamental Research Funds for the Central Universities of China, grant number 2682019CX77; Natural Science Foundation of China, reference number 52150410414; and Interdisciplinary Research Projects of Southwest Jiaotong University (No. 2682021ZTPY085).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data available upon request.

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

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