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## Original Research Article

# Appropriateness of the Historic Gardens for Urban Agriculture Development in Birjand City (Iran)

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## Abstract

**Problem statement:** One of the historic capabilities of Birjand city (East of Iran) is the existence of a large number of historic gardens that, despite the great importance from the perspective of landscape architecture, sufficient attention has not yet been given to the gardens from the viewpoint of landscape planning. One of the newest global approaches to historic gardens is the revival of agricultural and productive capabilities of gardens through methods and approaches called urban agriculture. While urban agriculture encompasses the tangible edible heritage of urban gardens, it also prioritizes engaging civil society in agricultural activities. In urban agriculture, in addition to the owners of the gardens, urban dwellers benefit greatly from the collective gardening in the urban gardens.

**Research objective:** This study attempts to identify the strengths and weaknesses of Birjand's historic gardens for the development of urban agriculture and therefore seeks to answer the following question: Are Birjand's historic gardens appropriate for urban agricultural development?

**Research method:** The research method in this study is analytical-descriptive and main data were collected from bibliographic databases and through interviews with garden managers, experts, consultants and some gardeners about 11 historic gardens. In addition, field studies in historic gardens have been conducted by the authors. Questionnaires were also used to collect the data including physical facilities of gardens, agricultural production activities in gardens, agricultural and horticultural objectives, marketing of horticultural products and agricultural economics.

**Conclusion:** The results show that a large part of the area of Birjand's historic gardens is dedicated to agricultural activities. According to the findings of this study, historic gardens have the potential to create opportunities for public participation in the production, training and consumption of agricultural and horticultural products. A combination of different goals, whether commercial, educational, social, therapeutic, or environmental, can be the key to the success of place-making of the historic gardens through urban agriculture. According to this strategy, the historic garden can be a place for interaction between different groups and users. Therefore, the formation of Continuous Productive Urban Landscapes (CPULs) depends on the strategy of public participation and involving citizens in the re-planning of historic gardens for the development of the edible public green space so that all gardens, whether private, public, or endowed, would be places for the presence and participation of citizens in the development of urban agriculture.

**Keywords:** *Historic Gardens, Birjand, Urban Agriculture, Landscape Architecture, Participatory Planning.*

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## Introduction

Despite the irreplaceable role of urban agriculture as a valuable strategy to get equipped for dealing with the multifaceted threats of urban instability and its role in public health as a tool for promoting urban development by providing ecological services (Clark & Nicholas, 2013) as well as attention to the fact that new approaches to sustainable urban development and urban green space seek to plan and protect open spaces for natural habitats, active recreation and multifunctional agriculture (Dubbeling, Bracalenti & Lagorio, 2009), Iran's open and public urban landscapes have not yet been studied in terms of adaptation for the development of urban agriculture. However, planting fruitful plants in cities seems to be an economically viable option for both municipalities and local people (Lafontaine-Messier, Gélinasb & Olivier, 2016). Urban agriculture is a complex system that offers a range of interests and benefits, including traditional activities, such as production, processing, marketing, distribution and consumption, to multifaceted benefits and services that have received less attention and research. Lesser-known dimensions and benefits of urban agriculture include leisure and recreation, economic dynamism, entrepreneurship and business prosperity, personal health and well-being, health and social welfare, landscape beautification and environmental remediation (Philips, 2013, 48). Today, Iranian cities are involved in multidimensional problems and dilemmas that the basic and common solutions to these problems can be urban agriculture and horticulture (Khalilnezhad, 2016, 125). Issues and problems of Iranian cities can be divided into two groups: socio-economic and troubles related to environmental matters and are dependent on location. On the other hand, most of the unemployed population lives in urban areas where educated young people make up the majority. Today, while most Iranians live in cities, land fragmentation, water scarcity, urban sprawl, citizen poverty and rising unemployment

have become a common problem in Iranian cities. These socio-economic threats have coincided with environmental and spatial problems. Many Iranian cities were established on the most fertile lands. In fact, the separation between these two types of space, agriculture and urban space, is a phenomenon that has occurred in recent decades (Lička & Maldonado, 2016, 116) and should gradually stop in future developments and plans and reverse the trend. But both in Iran and in other countries, in recent decades, fertile agricultural lands in and around the city have changed to the development of gray infrastructure and therefore, unlike the quantitative development of urban green spaces, citizen participation in the process of planning, design and landscape management is ignored. Therefore, there are many capabilities for entrepreneurship, production, social gardening and ecological agriculture that can be established and flourished by citizens in urban green spaces. These fields of production and entrepreneurship, in addition to socio-economic benefits, can mutually improve the environmental and ecological conditions of green infrastructure. The main purpose of this study is to investigate the role of historic gardens in the development of urban agriculture in Birjand in the east of Iran (Center of South Khorasan province). Therefore, research questions include:

- What role can be designated for the historic gardens (as a multifunctional landscape and cultural heritage) in the process of development of urban agriculture in Iran?
- What is the capacity of historic gardens in terms of design, structure and heritage to create urban agricultural phenomena in it with the aim of citizen participation?

## Research methodology

The research method in this study is analytical-descriptive and basic information has been collected from library resources, interviews with garden managers, experts, consultants and some gardeners

about 11 historic gardens in 2015. In addition, field studies in historic gardens were conducted by the authors. Using qualitative analysis in the methodology of problem-based studies to evaluate historic gardens, this study explores the physical features of historic gardens located within or near the city of Birjand to recognize the role that these gardens can play in reviving urban production and agricultural spaces for citizens. Through interviews with cultural heritage officials, garden managers and consultants and gardeners, the authors gathered important information about construction history, land ownership, garden size and production capacity, as well as other basic information about garden history. In addition, a questionnaire was used to collect the data. The questionnaire used was based on the questionnaire of the European Urban Agriculture Research Project (Lohrberg, LičKa, Scazzosi & Timpe, 2016, 218), which includes identifying different dimensions of the urban agricultural landscape, including the physical facilities of gardens, agricultural and productive activities in gardens, agricultural and horticultural objectives, horticultural marketing and agricultural economics.

### Literature review

Many researchers have acknowledged that the benefits of urban agriculture go beyond social and environmental benefits, including food security, improving air quality and regulating the water cycle. The considerable advantage of urban agricultural systems is that they can be achieved in many spatial forms - from gardens, social farms and rooftop gardens to food landscapes and historic gardens - and therefore can profoundly promote urban biodiversity and provide vital ecological services such as pollination, pest control and climatic resilience (Lin, Philpott, & Jha, 2015). Another interesting point is the dimensions of urban agricultural health. According to documented information, the consumption of fruits produced in cities is not harmful to human health. Also,

fruit trees and shrubs are more suitable for urban gardening in polluted urban areas and produce a healthier crop compared to vegetables (Von Hoffen & Säumel, 2014). Testing the health of horticultural products by Säumel et al. (2012) assures us that the presence of barriers between planting sites and streets reduces the content of metal elements that cause crop toxicity. Therefore, traffic-related environmental pollution in urban agricultural products can be significantly reduced, if the sites of planting are enclosed by buildings and a large volume of vegetation that reduces the impact of air pollutants.

The system of productive urban landscapes is equivalent to the concept of CPUL, in which urban agriculture, like roads and energy systems, must be considered as an element of the essential infrastructure in sustainable cities. The authors define CPUL in a coherent and planned combination of interconnected urban open spaces that includes areas for urban agriculture and productive ecological landscapes (Viljoen, Bohn & Howe, 2005). The system of productive urban landscapes can be considered as a new generation of public parks that have combined traditional recreational and leisure facilities with spaces dedicated to agriculture, ecological corridors, pedestrian and bicycle paths. The goal of the Continuous Productive Urban Landscapes (CPULs) is to improve the production quality of urban open spaces economically (food production), socio-cultural status (quality of life) and environmentalism (reduce carbon dioxide emissions, improve biodiversity and air quality and combat thermal islands). In addition, it is important to note that today, beyond productive urban landscapes, some scholars speak of edible cities (Viljoen & Bohn, 2014; Gorgolewski, Komisar & Nasr, 2011). Edible City is a concept for introducing productive urban landscapes, urban agriculture and urban gardening as the essential elements and infrastructure of a sustainable city. Historically speaking, Persian gardens are the traditional example of urban agriculture

(Ruggles, 2008), which still exists in the form of historic gardens in Iranian cities, including Birjand city. In historic gardens, in addition to structural plants and ornamental green space, most of the garden area is dedicated to fruit and productive plants. But so far, the Persian garden system has not been studied from the perspective of the agricultural landscape. Persian garden designers used all the potential to create the elements needed to create an artificial environment using soil fertility techniques, irrigation systems and arranging environmental elements to produce shade and vegetation. Socio-environmental problems were solved in a way in the Persian garden, the product of which is to create an artificial ecological landscape (man-made) that in addition to creating an attractive and enjoyable environment to extend body and soul and relieve fatigue, also produces agricultural products and fruits. There are several elements in the Persian garden that encourage people to attend these cultural-historic sites. Shade, water, geometric design and architecture are the most important determinants. The various components of the Persian garden, including water, planting, geometry and architecture, have all reached a satisfactory and harmonious combination (Wilber, 1969, 14). This is something that greatly harmonizes the design and structure of the Persian garden for the development of urban agricultural patterns. For example, about the water, its entire application was not limited to irrigating farms. Aesthetic and ornamental purposes were also targeted and therefore in the Persian garden, the design of beautiful waterways, the use of colors, tiles and colorful paintings, fountains and the use of natural reflections of the sky in water have been considered to meet such goals (Jeyhani & Omrani, 2007, 234). Thus, every component and also the combination of components in the Persian garden act in such a way that the garden is a demonstration of the ability to create a multifunctional landscape. The elements in the Persian garden are divided into two groups: natural (soft landscaping) and artificial

elements (hard landscaping), both of which together form the body of the garden (Zangeri, 2012, 38). Artificial elements are organized based on geometric design on a large scale in the garden in such a way that on the micro scale of the design, the arrangement of natural elements along with architectural elements is determined. The architectural elements of the garden consist of architectural spaces, each of which has structures in accordance with the required functions and spaces. For example, mansions, walls, sidewalks and garden entrances are among the garden's artificial elements. Among the natural elements of the garden, we can mention trees, shrubs and of course water, which is the most important element that forms the garden (Shahcheraghi, 2013, 29).

The important point in forming a CPULs is to identify the points and centers of agricultural production and to create a unity of procedure in the macro management of these gardens at the city, suburban and metropolitan scales. Currently, a large number of historic gardens are registered as historic agricultural remnants in the list of the cultural heritage of the country. However, due to the diversity of the ownership system (endowment, public, private), the status of available water, the way managers look at gardens, the change of garden owners over time, etc., it has not yet been possible to form a system of productive urban landscapes in Iran. Birjand is one of the cities that can be selected as a study sample due to a large number of historic gardens. The first and the most important step in the development of urban agriculture is to identify potential spaces and evaluate their potential for the development of urban agriculture.

### **Descriptive information of the studied gardens**

The gardens studied in this study include 11 historic gardens called Akbariyeh, Amirabad, Bahlgerd, Hosseinabad, Seyedabad, Rahimabad, Shokatabad, Aliabad, Masoumieh, Manzariyeh

and Mood. Most of the historic gardens of Birjand were built in the Zandieh and Qajar periods and evolved in the Pahlavi period. Undoubtedly, Bagh-e-Mood was established as a unique example during the Safavid period. Except for Akbariyeh and Rahimabad, which are located inside the city, Shokatabad, Masoumieh and Manzariyeh are located on the outskirts of the city and the rest of the gardens are located outside the city but near Birjand (Fig. 1). The ownership status of the gardens is different, so that Akbariyeh, Shokatabad and Bahlgerd have endowed ownership, Rahimabad and Seyedabad gardens are state-owned and the rest of the gardens are privately owned. In terms of the status of registration in the cultural heritage, all the studied gardens have been registered in the list of the cultural heritage of the country. An important feature of these gardens is the Persian gardening pattern and their linear form, which are a unique example of Persian gardening and garden pattern in South Khorasan. The physical structure of the gardens is very similar to each other. Thus, regarding topography, all of these gardens were

constructed on the grounds with a low slope. Moreover, all the cases encompass the regular vegetation and their architectural system is the Persian garden which can be recognized through the linear organization of the garden, a central pavilion, having the enclosed wall and entrance structure. In all these gardens, the agricultural zone is the largest garden area demonstrated in Fig. 2.

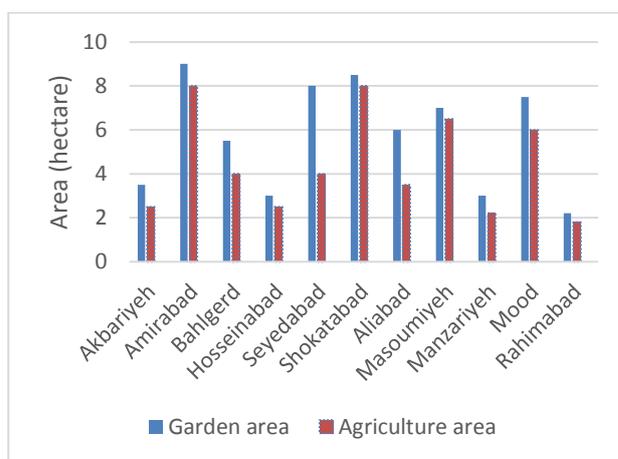


Fig. 2. Agricultural landscape area of historic gardens in relation to the total area of the garden. Source: authors.



Fig. 1. Locations of Birjand’s historic gardens relative to the city periphery (yellow line). Source: authors based on Google Earth.

## Findings

### • Physical planning of the gardens

Due to the multifunctional nature of historic gardens (Farzin, Khalilnezhad, Moradzadeh Mirzaei & Zarei, 2020), the physical structure of the gardens was studied to identify the functional zones of each garden. Landscape zones can include agricultural, industrial, residential, nature protection and recreation zones. According to the findings of this study, the widest physical zone in all gardens is the agricultural zone. But in addition to the agricultural zone, Akbariyeh, Bahlgerd, Rahimabad, Shokatabad, Masoumieh and Mood gardens encompass residential and recreational zones; Seyedabad and Amirabad gardens have the recreational zone and Hosseinabad, Manzariyeh and Aliabad gardens have the residential zone.

### • Physical facilities of the gardens

The physical facilities of gardens are defined in three parts: water, buildings and plant system. All gardens have water available for agriculture, but the amount and source are different so that Bahlgerd garden has the lowest water flow (0.03 liters per second) and Amirabad gardens (70 liters per second from wells and 0.03 liters per second from aqueducts), Akbariyeh (50 liters per second from wells and 0.04 liters per second from the aqueduct) and Rahimabad (50 liters per second from the well and 0.02 liters per second from the aqueduct) have the highest access to agricultural water. The volume of water available for agriculture in Aliabad and Hossein Abad gardens is 0.05, in Manzariyeh and Mood is 0.04, Shokatabad and Seyedabad is 0.1 and in Masoumiyeh garden is 0.06 liters per second. The irrigation system in Bahlgerd and Seyedabad gardens is a combination of traditional and modern types (transfer of water to plots through pipes). In other gardens, the irrigation system is traditional. The source of water supply in most gardens is the aqueduct, but in some, such as Akbariyeh, Amirabad, Rahimabad and Shokatabad, in addition to the aqueduct, the water of well is also used. Masoumiyeh and Seyedabad do not have

aqueducts for agricultural water supply and depend on well. The most important water problems in Akbariyeh, Amirabad and Bahlgerd gardens are the lack of aqueduct water at some times of the year and in Rahimabad garden, in addition to the lack of aqueduct water, is the lack of independent water for the garden. Water systems of the historic gardens of Birjand include pools, channels and fountains (in Bahlgerd, Akbariyeh, Amirabad, Mood, Hosseinabad, Rahimabad and Shokatabad). Water systems in Aliabad, Masoumiyeh, Manzariyeh and Seyedabad gardens are limited to pools and channels and therefore do not have decorative fountains.

### • Architectural heritages

The questionnaire in the buildings section includes the identification of historic buildings (pavilions and mansions, warehouse, stables, entrances, fence), additional and new buildings, the possibility of staying in the garden for people working in the agriculture sector, garden fence, roofed space to be used in gardening training for those interested and buildings that can be developed or changed for entrepreneurship and employment. Due to the historic nature of all the gardens studied, they have almost the same capabilities in terms of buildings. However, gardens differ in the spatial details of buildings, such as the area of space for agricultural education and the buildings that can be developed or changed for entrepreneurship and employment. According to Table 1, the area of closed space for entrepreneurship and employment varies from a minimum of 90 square meters (Hosseinabad Garden) to a maximum of 600 square meters (Shokatabad Garden).

### • Plant system

A study of the plant system of gardens was conducted to identify the originality of the Persian garden, plant originality, historical and original plant species, non-original ornamental species, historical and original fruit species, non-original fruit species and type of production (agriculture, horticulture, aquaculture and livestock). In addition

to the owners and gardeners, the experts of the South Khorasan Historic Gardens Management

Center were consulted on this issue. As Table 2 shows, most of the 11 gardens studied encompass

Table 1. Architectural heritage and building facilities of the studied historic gardens. Source: authors.

Gardens' name	Historic buildings	Non×original and new buildings	Possibility to accommodate in the garden	Garden fence Enclosed	Available space for agricultural education	Buildings for entrepreneurship and employment (square meters)
Akbaryeh	✓	✓	✓	✓	✓	270
Amirabad	✓	✓	✓	✓	✓	250
Bahlgerd	✓	✓	✓	✓	✓	250
Hosseinabad	✓	✓	✓	✓	✓	90
Seyedabad	✓	✓	✓	✓	✓	250
Shokatabad	✓	✓	✓	✓	✓	600
Rahimabad	✓	×	✓	✓	✓	160
Aliabad	✓	✓	✓	✓	✓	110
Masoumiyeh	✓	×	✓	✓	✓	100
Manzariyeh	✓	×	✓	✓	✓	100
Mood	✓	×	✓	✓	✓	100

Table 2. Ornamental species and fruit trees in the studied gardens. Source: authors.

Gardens' name	Original ornamental species	Non×original ornamental species	Original Fruit trees	Non×original Fruit trees
Akbaryeh	Pines, boxwoods	Roses, cypresses, common privets	Pistachios, pomegranates, apricots, berries, figs, blackberries	Jujubes, barberries, plums
Amirabad	Pines, cypresses	Roses, common privets	Pomegranates, apricots, berries, figs, pistachios	Jujubes, barberries, plums
Bahlgerd	Pines, Plane trees	×	Pomegranates, apples, berries, pistachios	Barberries, saffron
Hosseinabad	Pines	Jasmines	Pomegranates, apricots, apples, berries	Barberries, saffron, grapes
Seyedabad	Pines	Jasmines	Pomegranates, apricots	Barberries, saffron
Shokatabad	Pines, peppers	Jasmines, roses	Pomegranates, apricots, berries, grapes	×
Rahimabad	Pines, cypresses	Thujas, roses, common privets	Pomegranates, apricots, berries, figs, blackberries	Jujubes, barberries, plums
Aliabad	Pines	×	Pomegranates, apricots, berries	Barberries, grapes
Masoumiyeh	Pines	Jasmines	Pomegranates, apricots, berries, grapes	×
Manzariyeh	Pines	×	Pomegranates, apricots, berries, pomegranates, apples	Barberries
Mood	Pines	Common ivies	Pomegranates, apricots, berries, pomegranates, apples	Barberries

the plant origin (especially non-productive green space) and the historical species are fruitful and ornamental. Furthermore, the type of production in all cases is agricultural and horticultural. Among the historical and original fruitless plant species in the studied historic gardens, it can be referred to the pine, cypress, sycamore, boxwood and pepper; and in the section of fruitful plants, it can be mentioned the pomegranates, pistachios, figs, apricots, berries, grapes, jujube, barberry and apples. Among the non-original plants, we can mention jasmine (in Masoumiyeh); jasmine and rose (in Shokatabad), Common ivy (in Mood) and rose, cypress and common privet (in Akbariyeh) (Table 3).

• **Agricultural activities in the gardens**

According to the findings of this study (Fig. 3), in the gardens of Akbariyeh, Amirabad, Bahlgerd, Rahimabad, Shokatabad, Masoumiyeh, Manzariyeh and Mood, the main activity of the garden, despite being historic, is still agriculture and horticulture. In Hosseinabad and Seyedabad gardens, one of the main activities of the garden is agriculture and horticulture and in Aliabad garden, this

activity is very low. The number of years of activity in the new period of exploitation in the studied gardens is different. Thus, Akbariyeh, Mood, Shokatabad and Manzariyeh gardens have the most agricultural history and the gardens of Hosseinabad, Masoumiyeh and Seyedabad have the lowest history of agriculture and horticulture in the recent period, respectively. The studied gardens

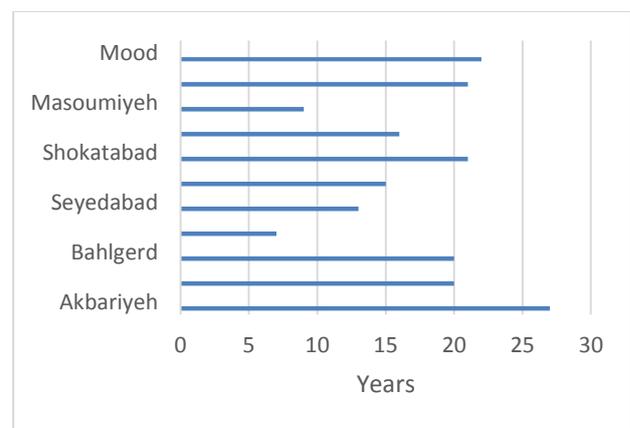


Fig. 3. Number of years of agricultural and horticultural activities in the studied gardens. Source: authors.

Table 3. Identification of the original and non-original plant species (productive and ornamental) of the studied gardens. Source: authors.

Gardens' name	Original Persian garden	Plant originality	Historic plant species	Non×original ornamental species	Historic Fructiferous species	Non×original productive species	Production system	
							Agriculture	Horticulture
Akbariyeh	✓	✓	✓	✓	✓	✓	✓	✓
Amirabad	✓	✓	✓	✓	✓	✓	✓	✓
Bahlgerd	✓	✓	✓	×	✓	✓	✓	✓
Hosseinabad	✓	✓	✓	✓	✓	✓	✓	✓
Seyedabad	✓	✓	✓	✓	✓	✓	✓	✓
Shokatabad	✓	✓	✓	✓	✓	×	✓	✓
Rahimabad	✓	✓	✓	✓	✓	✓	✓	✓
Aliabad	✓	✓	✓	×	✓	✓	✓	✓
Masoumiyeh	✓	✓	✓	✓	✓	×	✓	✓
Manzariyeh	✓	✓	✓	×	✓	✓	✓	✓
Mood	✓	✓	✓	✓	✓	✓	✓	✓

are different in terms of the number of employees in agriculture and horticulture, so that Amirabad (63 people), Seyedabad and Shokatabad (22 people) and Akbariyeh (15 people) have the most employed and involved people, respectively. The gardens of Aliabad (1 person), Mood (5 people) and Hosseinabad (7 people) have the lowest number of people working and involved in the agricultural sector, respectively (Fig. 4).

The agricultural production system in Akbariyeh, Amirabad, Bahlgerd, Rahimabad and Shokatabad gardens is integrated (traditional and modern) while in Aliabad, Seyedabad, Hosseinabad, Masoumiyeh, Manzariyeh and Mood gardens, this system is traditional. Among the 4 categories of landscape ecosystem services including provisioning, cultural, environmental and habitat services, the studied gardens have a different status. The most important ecosystem service of Manzariyeh, Mood, Masoumiyeh and Shokatabad gardens is provisioning (agriculture); in Hosseinabad and Aliabad gardens, provisioning-habitat (residential); and in the gardens of Rahimabad, Akbariyeh, Amirabad, Bahlgerd and Seyedabad, the cultural (tourism-education-health) and provisioning (agriculture).

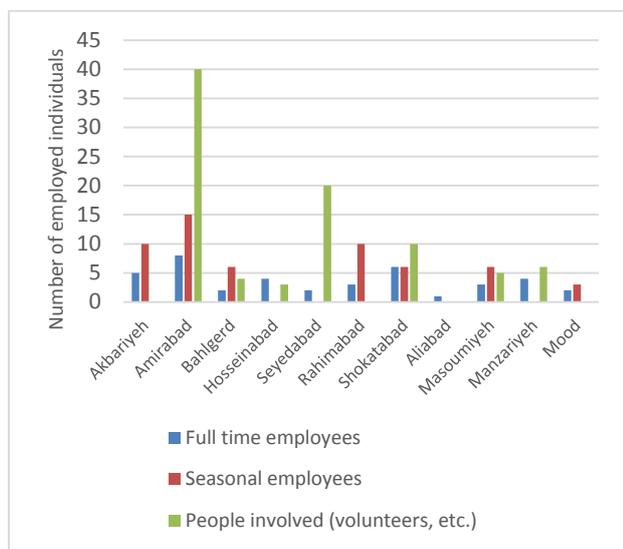


Fig. 4. Number of employees in the studied gardens. Source: authors.

• **Agricultural and horticultural goals**

In examining the main purpose of agricultural production in the studied gardens, the importance of 9 goals in the form of a range of insignificant, low importance, medium importance and high importance was examined. These goals include (1) commercial agriculture, (2) personal consumption, (3) food security, (4) education, (5) environmental protection and land management, (6) social, (7) recreation and welfare, (8) conventional land use and (9) research and development. The findings show that conventional land use (100%), social (75%) and commercial agriculture (67.5%) are the most important goals of agricultural activities in the historic gardens of Birjand. In contrast, food security (37.5%), education (47.5%) and personal consumption (50%) are the lowest goals of agriculture and horticulture in these gardens (Fig. 5).

• **Marketing of the garden products**

In examining the role of historic gardens in Birjand’s food supply, it is noteworthy that the products of historic gardens provide part of the consumption needs of the city, which mostly includes 9 types of fruits, flower and tree seedlings and saffron. Except for Aliabad and Masoumiyeh gardens, which do not meet the market needs in the current situation and Manzariyeh Garden, which meets the personal needs of the owner and sells only a part of the garden commercial product such as barberry, saffron and apricot; Akbariyeh Garden supplies part of the demand for apricots, green tomatoes, pistachios and figs; Amirabad meets part of the demand for apricots, pistachios, grapes and pomegranates; Bahlgerd covers part of the demand for apples; Hosseinabad meets part of the demand for apricots and apples; Rahimabad produces part of the demand for apricots, greengage and pomegranates; Seyedabad meets part of the demand for apricots and greengage; Shokatabad caters part of the demand for apricots and grapes and Mood meets part of the market demand for pistachios and barberry.

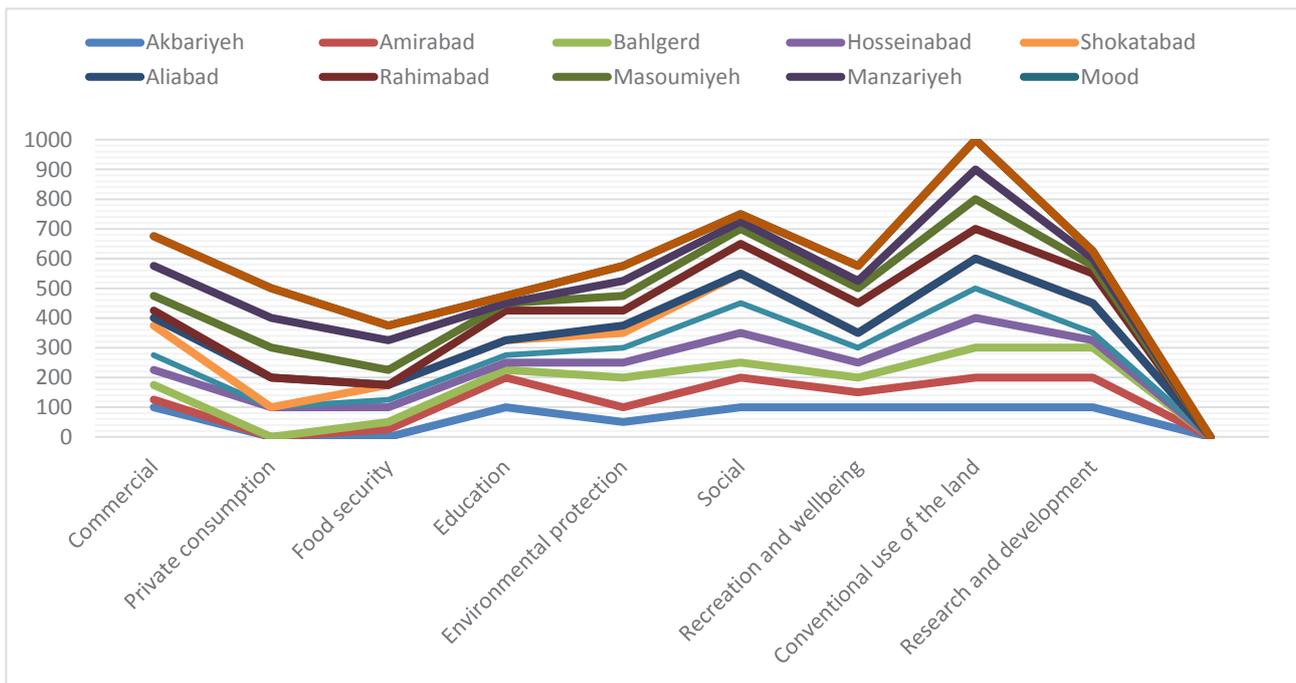


Fig. 5. The importance of the nine goals of agriculture in the studied gardens. Source: authors.

As Fig. 6 shows, the most diverse food products in those historic gardens are apricots (in 7 gardens), Pomegranate and barberry (in 5 gardens) and pistachios and grapes (in 4 gardens). The least diverse foods are strawberries and figs (in 1 garden), saffron and apple (in 2 gardens) and greengage (in 3 gardens). The method of sale in most gardens is indirect and wholesale and except for Manzariyeh products, which deliver the main products to customers in retail stores, access to the products of other gardens in retail is not available to the citizens of Birjand.

• **Agricultural economics**

A survey of agricultural economics of gardens including production value (not profit), number of full-time paid jobs including entrepreneurs per year, number of full-time unpaid jobs per year (including volunteers, etc.), number of people receiving educational services, the area of green and open space managed per hectare annually, agro-biodiversity production (agricultural biodiversity including the number of plants and

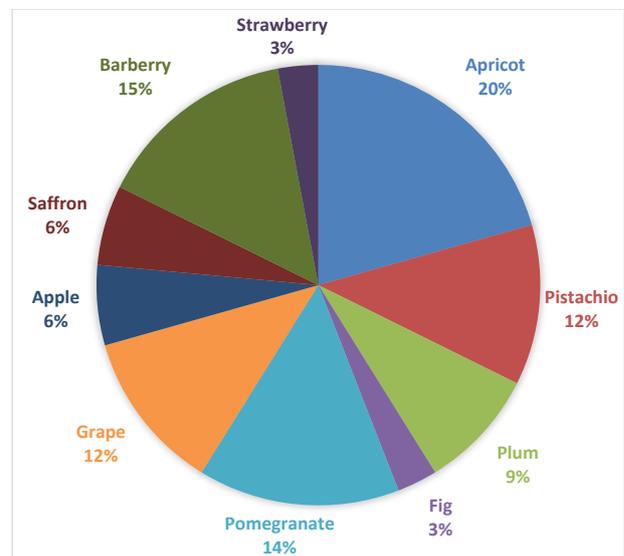


Fig. 6. Variety of food products in Birjand's historic gardens (based on the number of productive gardens per product). Source: authors.

animal varieties and cultivars produced) and maintenance and development costs of historic buildings, monuments, green space and routes. The production value of the garden was estimated

to be approximately one million, one million to five million, five million to 20 million, 20 to 100 million, 100 to 500 million and over 500 million Tomans per year. The findings show that the value of garden products in most historic gardens (Akbariyeh, Bahlgerd, Hosseinabad, Seyedabad, Mood and Shokatabad) was 20 to 100 million per year. The most valuable garden in terms of agricultural products is Amirabad Garden, which yields 500 million Tomans of garden products annually. The lowest values of production are Masoumiyeh and Aliabad gardens (1 to 5 million). In terms of the number of full-time employees receiving salaries per year, including entrepreneurs, there are more than 10 full-time employees in all of the gardens, except for Manzariyeh Garden (none) and Aliabad (one to five jobs). But in terms of full-time employees without receiving salaries (such as volunteers), the historic gardens of Birjand are in a different situation. Except for Mood, Masoumiyeh, Bahlgerd, Hosseinabad and Shokatabad gardens, which have 1 to 5 full-time employees without payment per year, Manzariyeh Garden has 5 to 10 employees and Seyedabad Garden has more than 10 employees and Aliabad, Akbariyeh and

Rahimaabad do not have volunteer staff. In terms of the number of people receiving educational services (persons multiplied by hours per year), the most educational services are presented in the gardens of Amirabad (between 1000 and 5000 persons × hours per year) and Akbariyeh and Rahimaabad (between 100 to 1000 persons × hours per year, respectively). On the other side, the gardens of Hosseinabad, Aliabad, Masoumiyeh, Manzariyeh and Mood do not accommodate any educational services (Table 4).

• **Agricultural biodiversity**

Agricultural biodiversity includes the number of varieties and plant cultivars produced in each garden. According to the findings of this study, the most diverse agricultural biodiversity was seen in Akbariyeh Garden (10 to 20 species) and then in Amirabad, Bahlgerd, Hosseinabad, Rahimeabad and Amirabad Gardens (5 to 10 species). The lowest agricultural biodiversity was seen in Mood, Manzariyeh, Shokatabad, Masoumiyeh and Aliabad gardens (1 to 5 species).

• **Maintenance and development costs**

In this section, maintenance and development costs in gardens include costs related to historic buildings and structures, monuments, green

Table 4. The number of educational services provided in the studied gardens. Source: authors.

Gardens' name	No educational service	Less than 100 persons × hours per year	Between 100 and 1000 persons × hours per year	Between 1,000 and 5,000 persons × hours per year	More than 10,000 persons × hours a year
Akbariyeh			✓		
Amirabad				✓	
Bahlgerd		✓			
Hosseinabad	✓				
Seyedabad		✓			
Shokatabad		✓			
Rahimabad			✓		
Aliabad	✓				
Masoumiyeh	✓				
Manzariyeh	✓				
Mood	✓				

space, paths, etc. In most of the studied gardens (including Mood, Shokatabad, Masoumiyeh, Bahlgerd and Seyedabad) the maintenance costs are 20 to 50 million Tomans per year. The highest maintenance costs belong to Akbariyeh, Amirabad and Rahimabad gardens, which are 50 to 100 million Tomans per year. The lowest maintenance costs belong to Aliabad Garden (zero), Manzariyeh and Hosseinabad Gardens (5 to 20 million Tomans per year).

## Discussion

According to the findings of this study, the widest physical zone in all gardens is the agricultural zone, which shows the importance of historic gardens in terms of food production for citizens. Therefore, historic gardens, in addition to the cultural landscape and architectural heritage, due to the preservation of the agricultural zone can be regarded as urban or peri-urban agricultural landscapes. Therefore, the mere emphasis on the preservation and restoration of buildings and architectural heritages degrades the importance of the garden as a center of production and agriculture in the city. In Birjand city, all the studied gardens have physical facilities in three parts: water, buildings and plant system. All gardens have water and land available for agriculture which due to their location in the heart of the city (Akbariyeh and Rahimabad) or the outskirts of the city (Shokatabad, Masoumiyeh, Manzariyeh, Bahlgerd, Hosseinabad, Aliabad, Seyedabad and Amirabad) must be regarded as the available and accessible spaces for planning to create a system of productive urban landscapes.

In addition to the basic agricultural facilities, all the studied gardens have historic buildings that due to the enclosure of the garden, the buildings can be used for the development of education and entrepreneurship in a safe way because the historic buildings of the garden (mansions, pavilions, paths, fountains, channels, fences, entrances and roofed architectural spaces) increase the attraction of

the gardens to the citizens. But because the vast majority of gardens, especially in the ornamental landscape and the central axis of the garden have a historic plant system, in addition to agricultural capabilities, they have recreational and tourism capabilities that are the basis for the development of agricultural tourism and leisure agriculture.

Leisure agriculture (agrileisure) is the common denominator of the overlap of agricultural phenomena, leisure and social change, connecting the supply and demand of leisure and farm-based tourism through processes of economic diversity, community development and environmental and ecological sustainability (Amsden & McEntree, 2011). The main difference between “leisure agriculture” and “agricultural tourism” is that most market participants and community-sponsored agriculture (CSA) are not tourists. Rather, they are members of so-called civic agriculture associations that have a keen interest in food production, agriculture, strengthening group interactions and social experiences (Farmer et al. 2014). The CSA Market for Farmers and Community-Supported Agriculture provides consumers with a range of services, including access to fresh, quality and local food products, as well as the opportunity to learn how to produce food through interaction with farmers and producers. In addition to buying and selling products, such local agricultural markets have a recreational and social dimension. In fact, valuable leisure and social activities, which are grounds for the development of deeper relationships in the community, are another advantage of such local markets, which are formed based on urban agriculture. In general, a range of nutritional, educational and recreational services and benefits are achieved both by participating in the farmers’ market and by participating in CSA-supported agriculture.

Therefore, one of the important points in urban planning and design and landscape architecture is to pay attention to the importance of locating places and spaces for the distribution of local

food products in different areas and geographical locations of the city. However, each class of people lives in a specific geographical environment and it is important that everyone has access to local food products. One of the most important of these spaces in the city of Birjand is the historic gardens. Therefore, the administrators of Cultural Heritage and municipalities who are responsible for facilitating local agricultural markets or other leisure farming experiences should physically locate such sites in historic gardens to provide access for both farmers and buyers (Sherriff, 2009). Another important feature of Birjand's historic gardens is agricultural tourism (agritourism), which is a combination of agricultural production and tourism activities that encourage citizens and tourists to visit historic gardens for various reasons. Some of the goals of agricultural tourism are enjoyment, education, active participation in agricultural production activities and experience of agricultural life (ibid.). Making a connection between tourism (food demand) and agricultural production is vital in maximizing the benefits of historic gardens (Torres, 2003). In China, agritourism is a type of commercial urban agriculture, the recent development of which in suburban areas has led researchers to consider agricultural tourism as a tool for integrated urban and rural development and coping with some negative effects of urbanization (Yang, Cai & Sliuzas, 2010). But agritourism is not just about agriculture and beyond agriculture, in some countries, such as the United Kingdom, garden tourism is popular and many gardens are open to the public. In fact, visiting small private gardens will satisfy garden enthusiasts. It is also the case for those who take refuge in the garden to have a pleasant day or to spend time with friends or family (Lipovská, 2013), whose Iranian example is the historic gardens.

According to the findings of this study, in the gardens of Akbariyeh, Amirabad, Bahlgerd, Rahimabad, Shokatabad, Masoumiyeh, Manzariyeh and Mood, the main activity of the garden, despite

being historic, is still agriculture and horticulture. In Hosseinabad and Seyedabad gardens, one of the main activities is gardening, agriculture and horticulture and in Aliabad garden, this activity is very low. Activation of agricultural capacity of Aliabad Garden can also be done in the process of urban agriculture development of Birjand. Because one of the goals of urban agriculture, in addition to the production of organic food, is to promote the ecosystem services of historic gardens. Therefore, in Manzariyeh, Mood, Masoumiyeh and Shokatabad gardens, which have active agriculture, cultural services (gardening education, recreation and agricultural tourism) should be promoted. In Hosseinabad and Aliabad gardens which provide provisioning and habitat services, the promotion of environmental services must be regarded. On the other hand, in the gardens of Rahimabad, Akbariyeh, Amirabad, Bahlgerd and Seyedabad which accommodates cultural (tourism-education-health) and provisioning services (agriculture), the ecosystem services must be promoted through habitat services.

It should be noted that the concept of recreation in the garden is very different from other quasi-natural spaces such as urban parks. In historic gardens, the concept of multifunctional recreation should be discussed, which is any recreational services provided by agricultural lands to family members, visitors, neighbors and the general public, with or without economic benefits (Barbieri & Valdivia, 2009). Traditionally in the United States, farms have been considered as a source of recreation and leisure that provide leisure opportunities for strangers in addition to family members (Barbieri & Valdivia, 2010). The results of a study in Missouri (USA) show that family farms, in addition to producing food and fodder, provide recreational services for rural communities. The most important of these services is a combination of recreational and non-consumptive uses. The results of the present study also show that in addition to other social benefits provided by historic gardens (such

as habitat and biodiversity protection, rural heritage protection), recreational services should also be considered and included in the list of services provided by the edible landscape.

On the other hand, the originality of the plant system of the studied historic gardens is the core of “multi-purpose plantings”, which are gardens whose multi-purpose trees and crops are known to be versatile. Multipurpose trees produce a range of tangible products such as fruit, leaves, bark, twigs, timber, roots and medicinal and other uses. In general, crops are less versatile than trees. But among them, some species can directly or indirectly produce a variety of products. Planting a mixture of herbaceous plants and flowers, in addition to producing forage, will enhance biodiversity and even be aesthetically effective in creating beautiful and pleasing landscapes. Gardens located in the suburbs of Birjand (Amirabad, Shokatabad, Masoumiyeh, Manzariyeh and Bahlgerd) are the best places for the construction of multipurpose green spaces and multifunctional plantings whose production and horticultural system can produce a wide range of products. One of the advantages of constructing multi-purpose green spaces around the city is the accessibility and visibility of production processes by citizens. In fact, it should be noted that the most suitable places for multi-purpose plantings are historic gardens while observing the preservation of the essentials of the garden plant system. Because planting fruit trees in public spaces, such as neighborhoods with low-income residents, no one takes responsibility for the green space and therefore soon after the relocation of residents, planted trees are destroyed and decayed (Bhatt, 2005), while historic gardens have a public trustee or a private owner and such ownership will guarantee the care of productive plants.

In the study of the main goals or objectives of gardening in the studied gardens, it was found that conventional land use (100%), social (75%) and commercial (67.5%) are the most important goals of agriculture in historic gardens. In contrast,

food security (37.5%), education (47.5%) and personal consumption (50%) are the lowest goals of horticulture in these gardens. In this regard, planning the cultural landscape of the Persian garden heritage with an urban agriculture approach can lead to a boom in the production of historic gardens with the aim of recreation and welfare of citizens. Carrying out research and development on issues related to agriculture and urban horticulture in these gardens, which does not contradict the current goals of garden owners in the field of commercial production. Such an approach even has a positive effect on the marketing and sale of garden products because the branding of Persian garden products and their sales leads to an integrated network of commercialization of urban agricultural products of historic gardens with branding and sales, instead of indirect and wholesales, which make little profit to the owners of the garden. Direct garden products with the Persian garden brand in the distribution network to citizens will even boost the agricultural economy of historic gardens.

The study of educational services of gardens as historic green centers showed that the gardens of Hosseinabad, Aliabad, Masoumiyeh, Manzariyeh and Mood do not offer any kind of gardening education. In addition, even in the gardens of Bahlgerd, Seyedabad and Shokatabad, the amount of these services is provided to a minimum. Meanwhile, holding traditional agricultural training classes and gardening techniques in historic gardens will cause a deep connection between citizens and historic nature and will pave the way for the prosperity of urban agricultural jobs in Birjand. Some of these services, even in the form of workshops and summer schools, can cover part of the costs of maintaining and developing gardens. In this context, the concept of participatory landscape is debatable. According to this concept, historic gardens can be maintained in urban green space according to the principles of social management (Colding & Barthel, 2013). The Western example of such management is the allotment gardens in England and Sweden. In these

countries, allotment gardens are the site dedicated to the cultivation of food and flowers and are leased to individuals by local authorities. The next model experienced in the field of the participatory landscape is community gardens. Community gardens are the green sites managed by members of a local community where food products or flowers and ornamental plants are grown (Kingsley, Townsend, & Henderson-Wilson, 2009). Participatory gardens should be considered part of a broader and emerging network of “urban agriculture” that by it cannot provide sufficient products for urban consumption but provides important job and educational opportunities and therefore its development requires urban policy. Some studies in the United States show that the most common reason for people to participate in social gardens in New York is to access fresh food, enjoy nature and promote health (Armstrong, 2000). Unlike social gardens, where a certain group of activists usually seek to set up, manage and cultivate, they do not have the characteristics of a public green space in terms of being open to the public. “Public access gardens” (known as PAC gardens) are a special type of social garden in Berlin (Germany) that is largely open to public access and participation in the management of urban green spaces. These gardens are open to the public at all times and are managed collectively and collaboratively by various interested groups in the urban community. In these gardens, formal barriers, which usually prevent public participation in green space, either do not exist or exist very little. Public access gardens, or “PAC gardens”, are promoting the idea that social gardens should be considered as an overall management strategy for parks and urban green spaces (Bendt, Barthel, & Colding, 2013). Localization of global approaches to urban agriculture in Iran can take place in historic gardens and cities such as Birjand. Due to the proximity of people to historic gardens and the existence of scientific and academic centers, a new model of cultural heritage management can be based on the new needs of the citizens.

## Conclusion

The present study shows that a large part of the area of Birjand’s historic gardens is dedicated to agricultural performance. Interestingly, in addition to having agricultural and production space, which is a major prerequisite for urban agricultural development, the structure, design and heritage of the Persian garden are also compatible with the development of the urban agricultural landscape. From the health perspective, garden structural elements such as walls, structural plants and paths, obstacles and gaps are created between planting plots and outdoor streets and transportation routes. In addition, traditional agricultural and horticultural sciences and technologies rely on organic methods and can therefore be retrieved and supplemented using modern guidelines. Persian historic gardens in terms of antiquity and history of lands and spaces have been specific to cultivation and production and therefore the lack of change of use creates a basic assurance about the health of the soil and future crops.

Another capability of the Persian garden for the development of urban agriculture is to provide conditions for ecological considerations in urban horticulture. Value of native plants, protection of local plant species, traditional agriculture, planting and cultivating a diverse range of plant species and flowering plants are different dimensions of traditional gardening, horticulture and landscaping in Persian gardens. While in recent decades some traditional horticultural sciences and techniques, indigenous species and local engineering methods have been neglected or forgotten, the development of urban agriculture is an incentive to revive local traditions in horticulture and sustainable ecological well-being.

From a socio-cultural point of view, Persian gardens are highly suitable for the edible landscape development because the relevant instructions regarding socio-cultural considerations in the field of landscape architecture are effective on factors that in the Persian garden, the presence of these

cases can be observed and studied. Among them, we can mention the formal and classical landscaping of the main axis, the presence of non-fruitful plants and of course decorative and conifers, as well as historical works of art that make the attractiveness of the historic garden be emphasized and approved for planning the social edible landscape. Historic gardens with multi-purpose spaces and tangible heritage are suitable urban spaces for organizing multi-purpose programs, including non-garden programs and a variety of opportunities to present and express artistic and cultural affairs.

The garden wall, as a fence and the border of the garden space, restricts the physical access to the garden site and therefore increases the security of the garden products and fruits. Separation of production space from public space (separation of agricultural performance from recreational performance) and having a central meeting point are features of the Persian garden that allow different uses of the garden by different visitors, without disturbing the garden and production activities. In addition, the beauty, freshness, exceptional greenery and healthy environment of the Persian garden, which is a historical achievement in multifunctional landscape design, can be regarded as a pleasant experience for urban gardeners.

A strategy for using the potential of the Persian garden in the development of urban agriculture could include a cultural reinterpretation of it as an agricultural garden or the construction of urban gardens involving agricultural activity. This means that the Persian garden not only has cultural heritage values, but also provides agricultural services. The main components of this strategy are a suitable circulation network, garden elements, design and structure that allows the recreational and cultural experience of the garden not limit the production of urban horticultural products and integrates agricultural performance and other uses in the historic garden.

Garden facilities have been provided for various purposes. Sometimes the gardens are just a place

to relax, while in other cases, scenes from the agricultural landscape are also exposed to visitors. In fact, in addition to introducing the Persian garden as an urban agricultural site, establishing a relationship between citizens and the garden is also of particular importance. One of the main goals of establishing a connection between the people and the garden is to raise the importance of the place to the people and to raise public knowledge about agriculture and landscape. Another goal is to reduce the gap between agricultural productivity, green space performance and human use of the garden by creating mutual respect between different users. Thus, the value of cultural heritage beyond the historical and museum-oriented approach makes the garden an urban space for gardening activities of citizens.

Based on the explanations mentioned in this article, the Persian garden has the potential to create opportunities for public participation in production, educational and consumption activities. A combination of different goals, whether commercial, educational, social, therapeutic or environmental, can be a success factor for place-making of the Persian garden through urban agriculture. According to this strategy, the historic garden can be a place for interaction between different groups and users. These groups and users include staff and apprentices of urban agricultural workshops, students and youth groups, citizens who regularly visit the garden to rent gardening plots, visitors who come to the historic green space for leisure and customers. In this new perspective, the spatial and landscape attractiveness of urban agriculture is provided by the historic elements of the garden and therefore provides the opportunity to produce agricultural products with other people, or simply to consume food products from the famous heritage landscape. Therefore, the formation of Continuous Productive Urban Landscapes (CPULs) depends on the strategy of public participation and involving citizens in the re-planning of historic gardens for the development of edible landscape

and public edible green space. In this approach, all gardens, whether private, public, or endowed, are the grounds for the presence and participation of citizens in the development of urban agriculture.

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