

# **Urban Agriculture as a Tool for City and Landscape Planning in Iran with Emphasize On the Role of Persian Garden**

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In the Name of God

The Most Merciful, The Most Compassionate

**The Prophet Mohammad (Peace be upon him and his family) said:**

*“Every single person that cultivates something, Allah [God] rewards him/her as much as the fruit produced by that plant.”*

**Reference: Kanz al-Ummal (Book of Islamic hadith collection)**

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Technische Universität Kaiserslautern



# Urban Agriculture as a Tool for City and Landscape Planning in Iran with Emphasize On the Role of Persian Garden

A thesis submitted in fulfilment of the requirements for the degree of

**Doctor of Engineering**

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# Abstract

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This Ph.D. project as a landscape research practice focuses on the less widely studied aspects of urban agriculture landscape and its application in recreation and leisure, as well as landscape beautification. I research on the edible landscape planning and design, its criteria, possibilities, and traditional roots for the particular situation of Iranian cities and landscapes. The primary objective is preparing a conceptual and practical framework for Iranian professions to integrate the food landscaping into the new greenery and open spaces developments. Furthermore, finding the possibilities of synthesis the traditional utilitarian gardening with the contemporary pioneer viewpoints of agricultural landscapes is the other significant proposed achievement.

Finished tasks and list of achieved results:

- Recognition the software and hardware principles of designing the agricultural landscape based on the Persian gardens
- Multidimensional identity of agricultural landscape in Persian gardens
- Principles of architectural integration and the characteristics of the integrative landscape in Persian gardens
- Distinctive characteristics of agricultural landscape in Persian garden
- Introducing the Persian and historical gardens as the starting point for reentering the agricultural phenomena into the Iranian cities and landscape
- Assessment the structure of Persian gardens based on the new achievements and criteria of designing the urban agriculture
- Investigate the role of Persian gardens in envisioning the urban agriculture in Iranian cities' landscape.

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# DEDICATION

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*I dedicate this thesis to my darling wife; **Fatemeh**, and my beloved son; **Sepehr**.*

*Without their patience, understanding, support, and most of all love, the completion of this work would not have been possible.*

*Oh God, give me success and ability to compensate the inconvenience that these two dears have suffered because of my Ph.D. journey.*

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## Chapter 1 : Introduction

Iran is the 18<sup>th</sup> largest country in the world. It stretches from the Caspian Sea in the north to the Persian Gulf in the south. Iran is one of the world's major countries in oil export, and it is rich in natural resources. It has land borders with Armenia, Azerbaijan, and Turkmenistan in the north, Afghanistan and Pakistan on the east, and Iraq and Turkey in the west. According to United Nations Development Program (UNDP) calculations, between the years 1980 and 2012, Iran's HDI (Human Development Index) value increased by 67 percent, and – for the year 2012 – is 0.742 (high human development category). It means that Iran's annual growth in its HDI was over double the global average. Simultaneously, this would imply that – from a human development standpoint – during the period 1980-2012, Iran's policy interventions were both significant and appropriate to produce improvements in human development (UNDP, 2016).

Despite such positive progress, Iran strives to meet a range of development challenges such as poverty, environmental degradation, and disaster preparedness. Iran is very rich in natural resources and conservation of biodiversity, and the wildlife remains one of the most important challenges in this time of climate change (UNDP, 2016).

On one hand some researchers (e.g., Azami, Mirzaee, & Mohammadi, 2015) believe that Iranian urban growth and urbanization is unsustainable based on the indicators such as jobs, green urban economics, housing, nongovernmental organizations (NGOs), social participation, culture, public services and facilities, transportation, leisure, and medical care and health services.

But on the other hand, promoting the urban landscape quality and quantity has been taken into consideration. For instance, a decade ago, Tehran had 1,200 parks and public green spaces, which has now been increased to 2,000 parks. In the suburbs of Tehran, the green space per head is closer to 23 square meters. In that metropolitan trees have been planted on 14,000 hectares in and around the capital over the past six years. The City of Tehran has a five-year plan to increase its green space per capita to 20 to 25 square meters (Tehran Parks and Green Spaces Organization, 2016). The trend of expanding the green infrastructure has become a permanent strategy in Iranian cities municipality, and therefore, in many cities the areas of urban parks and green spaces has been increased during the recent decades. However, the biggest problem facing large cities is the lack of a comprehensive planning and management program for the protection and development of

vegetation, as well as moving at the appropriate pace with the population growth (Sabet Sarvestani, Ibrahim, & Kanaroglou, 2011).

Furthermore, this progressive approach to increasing the per capita green space has not coincided with the socio-ecological approach. One of the main strategies to promoting the socioecological sustainability of urban landscape is urban agriculture, food forestry, and edible landscaping (McLain, Poe, Hurley, Lecompte-Mastenbrook, & Emery, 2012; Middle et al., 2014; Morckel, 2015). But, the current desires in western and African cities in embedding the agricultural landscape into the urban spaces has been underestimated or ignored in Iran. It does not mean that the open spaces of Iranian cities have no edible plants, nor any agricultural functions. Since, beyond many trees in the streetscapes, parks, and urban gardens which are, fructiferous there are many private yards in attachment to houses, which are cultivated by the citizens for providing the vegetables and fruits, in addition to their functions for planting the ornamental plants. But, unfortunately, there isn't any systematic and scientific approach to development the urban agriculture landscape.

Despite the significant role of urban agriculture and food forestry as a valuable strategy to address multiple sustainability challenges, and its contribution to health, and that it can be used to promote sustainable urban development through providing ecosystem services (Clark & Nicholas, 2013); and the new visions of sustainable urban development and urban greening which consider the planning and preservation of open spaces for natural habitats, active recreation and multifunctional agriculture (Dubbeling, Bracalenti, & Lagorio, 2009) the Iranian cities' landscape and public spaces have not yet been studied and analyzed for the accommodation of the urban agriculture landscape. While the use of food trees in green public areas appears to be a financially valuable alternative for both a municipality and its local inhabitants (Lafontaine-Messier, Gélinasb, & Olivier, 2016), the question that would arise is how the edible and inedible plants can be integrated, what is the toolkit for landscape architects of the principle of urban public edible landscaping, especially in the cases such as Iran, where the particular formula and urban legacy has not yet been disseminated.

In this thesis, the author will try to demonstrate the significance of Persian gardens in envisioning the urban agriculture landscape in Iran.

## **An overview into urban agriculture**

‘Urban agriculture (UA) is a complex system encompassing a spectrum of interests, from a traditional core of activities associated with production, processing, marketing, distribution, and consumption, to a multiplicity of other benefits and services that are less widely acknowledged and documented. These include recreation and leisure, economy vitality and business entrepreneurship; individual health and well-being, community health and wellbeing; landscape beautification; and environmental restoration and remediation’ (Butler and Moronek, 2002 as cited in Philips, 2013: 48). It is noted that beyond enhancing food security, air quality, and water regulation which are some of the societal and environmental benefits of UA for cities, UA systems could appear in many forms – from community farms and rooftop gardens to edible landscaping and urban orchards –contribute significantly to urban biodiversity and provide critical ecosystem services such as pollination, pest control, and climate resilience (Lin, Philpott, & Jha, 2015).

Interestingly, results from a research project on integrating urban food production into municipal projects in Brazil, illuminate that urban agriculture offers nutritional and environmental benefits, and beyond beautification of the city, contributes to preventing soil erosion and even landslides within municipal boundaries and promoting waste recycling (Madaleno, 2000). Another significant point of view is the promotion eco-literacy among the children. From what Guitart, Pickering, & Byrne (2014) have found the school and community gardens represent an affordable and practical way of improving the health of city dwellers, especially children. The interesting point is that the community gardens can potentially be implemented in any city in different typologies including small gardens, rooftops, railway verges, abandoned sites, harbor fronts, and even in raised garden beds in public plazas (Guitart, Pickering, & Byrne, 2014).

While the findings of the Morckel (2015) study revealed that community gardens were perceived as more attractive than vacant lots, Middle et al. (2014) argue about the two positive aspects of community gardening which are integrated into underutilized public parks; individual and collective. At the individual level community gardens provide a venue for more accessible gardening and a restorative park environment as the destination for neighborhood walking. At the community level, gardens can facilitate bridging interactions between different social groups,

providing opportunities to participate actively in green space planning processes, and importantly, enhancing the environmental education (Middle et al., 2014).

Recently, one aspect of urban agriculture which is planting the food trees has come to the attention of researchers. Their intentional and strategic viewpoint into woody perennial food producing species is urban edible landscaping and improving the sustainability and resilience of urban communities. This phenomenon is known as urban food forestry and includes community orchard, urban orchard, urban fruit trees, city fruit trees, city fruit map, urban food forest, public orchard, edible park, and fruit tree project (Clark & Nicholas, 2013). The experience of the Seattle Parks and Recreation Department which allows neighborhood groups to establish public orchards, food forests and edible hedges in city parks, permits us to argue that the fruit trees can be used as incentives for city dwellers to plant trees, allowing them access to the fruits in urban wild and cultivated landscapes and provides opportunities for inhabitants to steward public natural resources and interact deeply with nature (McLain et al., 2012).

The other interesting point is the health aspect of urban agriculture. Based on the presented data the consumption of urban fruits is not harmful to human health and fruit trees and shrubs can be considered more suitable for urban gardening in highly polluted areas compared to vegetables (von Hoffen & Säumel, 2014). Examining the health of urban horticultural products by Säumel et al., (2012) ensured us that presence of barriers between cultivation sites and roads sharply reduces trace metal content, and therefore, the traffic-related contamination of inner city crops can be markedly reduced by undertaking to plant at sites where buildings and large stands of vegetation reduce airborne pollutant influxes.

It should be mentioned that among the different professions in environmental and spatial planning, there are urban planners and other municipal employees, landscape architects, landscape ecologists, and organization representatives and volunteers, which can play a significant role in determining the appropriate implementation strategies at a city-wide scale to maximize benefits to urban citizens and target high-risk groups (Napawan, 2014).

Landscape architects interested in pursuing urban agricultural landscape must become acquainted with the different spatial patterns of urban agriculture alongside the needs of public urban landscapes. Figure one portrays the diversity of spatial patterns of UA, including kitchen



gardens; allotment farming; edible landscapes; small- scale urban farm; large- scale urban farm; and retail, distribution, and support sites.

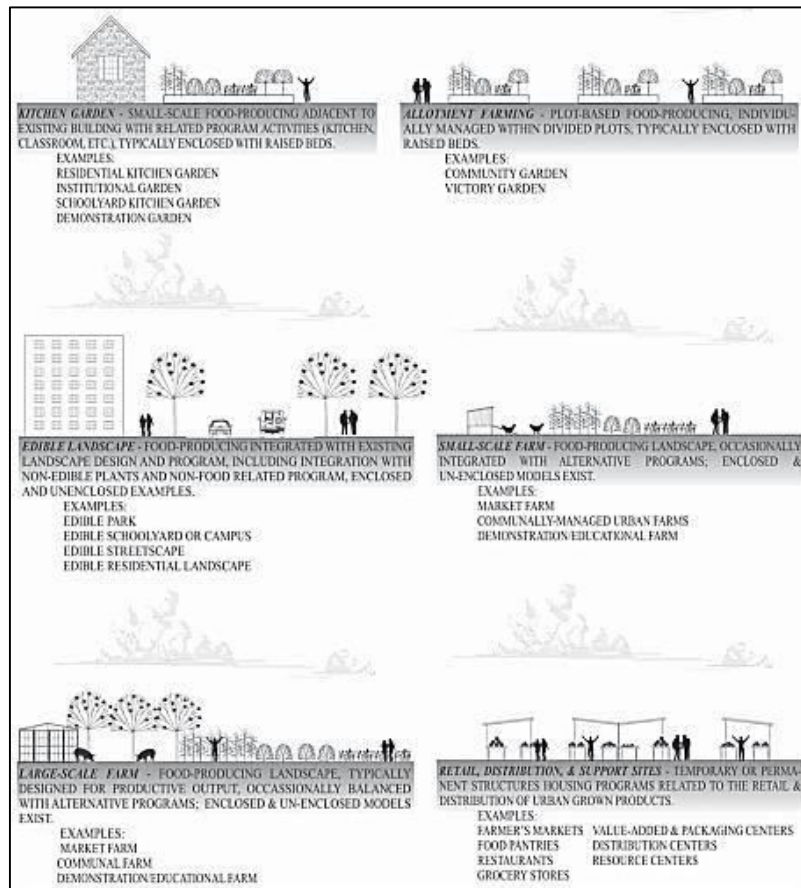


Figure 1. Urban agriculture spatial types (Napawan, 2014: 38)

## Why urban agriculture for Iran

Iran struggles with the multifaceted issues of which the primary solution would be urban farming. The Iranian cities problems can be categorized into two groups: socio-economic situation, and the environmental and place-related condition. While Iran's annual growth in HDI was over double the global average and its policy interventions were both significant and appropriate to produce improvements in human development, the most important issue from the socio-economic viewpoint is unemployment rate in urban areas. The current population growth and the unemployment rate is 1.29% and 12.2%, respectively (UNDP, 2016). On the other hand, most of the unemployed people are urban residents, youth and educated. Most of the Iranians now live in cities, and land fragmentation, water shortage, urban sprawl, citizen poverty, increasing the

unemployment rate are being become a common problem in Iranian cities. These threats have coincided with the environmental and place-related constraints.

Many Iranian cities were established in the most fertile territories. “Detachment between these two types of spaces the agriculture and the urban spaces is very recent” (Lička & Maldonado, 2016: 116), and should be slowly reversed in future development. But as mentioned in other countries during the last decades the agricultural lands around the cities have been converted to development the gray infrastructure, and despite the fact that the urban green spaces have been expanded, the citizen participation into the landscape planning, designing and maintenance have been ignored. While the planning, design and maintenance of urban landscapes and public greeneries must be participatory, the Iranian procedure concentrated in government departments and municipalities. Therefore, there is a lot of potential for job, production, community gardening, ecological agriculture which can be initiated in urban parks and green spaces, which beyond social-economic profitability can also mutually benefit the ecological and environmental circumstances of green infrastructures.

## **Objectives and inquiries**

The goals of this research are to explore the role of Persian garden and its spatial structure and design patterns in developing the urban agriculture landscape in Iran. This analysis is an attempt to evaluate to what degree a historic landscape designed for traditional functions and for purposes of the passed societies can provide the principles and values for regenerating the agriculture in Iranian cities. Increasingly, people and designers are attempting to create their own productive landscape in which to cultivate the edibles. The Persian garden with its emphasis on the multifunctional landscape may well offer inspiration for the productive landscape. However, the main concern of this thesis is to make suggestions as to how the productive and multifunctional identity of an Iranian garden may be captured in a landscape and green space that will be created in future.

Iranian landscape architects are trained to understand the necessary design considerations for providing a public greenery, but often lack the experience to utilize the Iranian tradition in

landscaping and gardening. For several decades the edible identity of Persian garden has been ignored, and thus, this research seeks to answer the following questions:

- Which role can be designated for the existing Persian gardens (as the multifunctional landscape and cultural heritage) for development the urban agriculture landscape in Iran?
- What spatial characteristics do Persian gardens have which provide the criteria for designing new productive landscapes?
- What planning and design considerations must landscape architects consider in creating a hybrid between production landscapes and public spaces based on Persian gardens model?
- How much is the appropriateness the Persian gardens design, structure, and heritage for involving the citizens in order to accommodating the urban agricultural phenomena?

In summary the research objectives can be expressed as the followings:

- Recognition the integrative landscape of Persian gardens
- Introduction the productive role of historic gardens in the modern context
- Preparing the distinguished toolkit of the principles of the productive landscape architecture for the open space planners and landscape designers
- Examining the appropriateness the structure, design, heritages, and location of Persian garden for development the urban agriculture based on the criteria derived from health concerns, ecological concerns, and spatial designing and programming concerns

## **Methods**

The methodology of this research is analytical, and the data has been gathered in library studies, interviews, as well as field studies in several Persian gardens. The field studies were conducted in summers 2014 and 2015 including interviews with managers, consultants, and also old gardeners which helped to complete the field studies.

Using qualitative analysis from an issue-based case study methodology to evaluate historic gardens, this research examines the existing physical characteristics of several Persian gardens in

Iran to determine the role these sites also can play in providing urban productive spaces to the urban environs. Drawing from the review of literature and resources, it examines pertinent characteristics of Persian gardens related to the definition and analysis of productive open spaces. Inferences from the literature enabled compilation of criteria associated with the physical patterns of food production landscapes that also provided public spaces.

Interviews with cultural heritage authorities, gardens' managers, consultants, and gardeners, provided information on the history of establishment, lands tenure, gardens size, and production capacity, as well as other basic information regarding the gardens history. Use of aerial photographs, maps, and on-site mapping and photographing techniques facilitated the creation of a series of plan and section diagrams of the garden structure and design. These data enabled the author to insight the characteristics of productive landscape in Persian garden, its ability to address the productive public space criteria, and site layout and design, and the relevant issues in designing the edible landscape. The surveys on several Persian gardens which have been registered as the World Heritage Cultural Landscape and some other registered historic gardens in Iran helped to identify the spatial and environmental criteria of designing the integrative and multifunctional landscapes based on Iranian tradition. It also informed development of design criteria that can be used to enhance the public space of production landscapes. As well, the principles can be used by landscape designers who are considering the integration of food production programming.

## **Persian Garden**

The Persian or Iranian garden is categorized under the Islamic garden and landscape category, because the location of its evolution and progress during the centuries was in Islamic countries such as Iran, Marrakesh, Turkey, Syria, Spain and Sub-continent India (Ruggles, 2008; Clark, 2014). Beyond the geographical identity of Islamic gardens, its main theme and idea, and its design and structure is appropriate to the Islamic believes and culture. Persian garden especially the garden which have been created during the previous ten centuries can be a branch of Islamic gardens and landscapes, which adapted to the Iranian culture, geography and history.

The Persian garden idea driving from a fundamental theme that of the *chahar-bagh* (from the Persian *chahar* meaning four and *bagh* meaning garden). The classic *chahar-bagh* is the fourfold

garden constructed around a central pool or fountain with four streams flowing from it, symbolically towards the four directions of space. The Islamic gardens created from approximately the tenth to the end of seventeenth centuries, in countries most obviously categorized as the traditional Islamic world: North African countries, the Near and Middle East, Turkey, Persia (present-day Iran) and the Indian sub-continent. The majority of the most outstanding Islamic gardens were created before the beginning of the eighteenth century when the influence of the western European gardening traditions began to be felt (Clark, 2014: 11).

In desert regions, the inhospitable environment is shut out by means of high walls and ever green trees-usually conifers, as they can withstand the wind and lack of water-to create a sanctuary within. The whole area is surrounded by walls within which are seemingly square plots of fruit trees- oranges, lemons, apricots, figs and pomegranates- all divided geometrically by irrigation channels and within walkways and avenues in between. Persian garden designers by meticulous choice of tree species (fructiferous-conifers) could significantly improve the financial performance of the productive system as well as preparing a cool and green places for sitting in and picnicking under trees near water while children play. Beyond producing the fruits and edible yields, the *chahar-bagh* is focused on rest, relaxation, entertainment and contemplation.

“The garden was for resting and taking refuge in, and for delighting in the cooling and soothing properties of water, for aesthetic and scenery delights of flowers, the scent of blossom, the glory of birds, as well as the protective shade of trees...Besides the contemplative aspect of the Islamic garden, it is also true to say that it was for pleasure and love-making, political discussion and parties, as well as for growing vegetables and fruit” (Clark, 2014: 34). Thus, there are a wide and meticulous choice of fruit and vegetables traditionally grown in the Iranian gardens, but the planting area of those fruit trees, flowers, and vegetables were divided into plots, separated by geometric paths or irrigation channels.

## **Introduction the case studies**

Akbariyeh and Rahim Abad gardens were the governmental gardens in Qajar and Pahlavi eras in Birjand territory (the capital of Southern Khorasan Province). The Bahlgerd and Amir Abad Gardens (Qajars gardens) have been constructed outside the Birjand and were connected to the rural context (Ranjbar, Mehrabani Golzar & Fatemi, 2005). Pahlavanpur as a residential productive garden is a Qajar garden which was constructed in the Mehriz territory (not far from Yazd), a city in the center of Iran (Yazd Cultural Heritage Office, 2013).

Shahzadeh garden as part of the other case study is located in the Mahan desert area and has marvelous terrace gardening on a sloping bed with residential and ceremonial functions (Abardasht Consultant Engineers, 2003). In addition to the registration all of those gardens in the list of Iran's National Cultural Heritage, Akbaryeh, Pahlavanpur and Shahzadeh gardens have also been recorded in UNESCO World Heritage. The other relevant case studies are ChehelSotun World Heritage garden, Masoumieh historical garden, Abbas Abad World Heritage garden, and Golshan historical garden.

## **Birjand's Gardens**

Birjand is a provincial capital of South Khorasan in the East of Iran and is known for its saffron, barberry, rug and handmade carpet exports. As a matter of fact, Birjand city was being regarded as the gate of East and India in the 17<sup>th</sup> century, the politician traffic was increased, and England and Russia established their consulate office in Birjand. Therefore, the local authorities of Birjand provided the appropriate space for meetings and socio-political traffics and designed and constructed the gardens as the natural and social condition in different eras (Saberifar, Karampour & Halajmoghadam, 2015). These historical gardens which show some similarities to each other are Akbarieh, Rahim Abad, Amir Abad, Bahlgerd, Masoumieh, and Shokat Abad.

Generally, in Birjand's gardens, the buildings are geographically extended from East to West. The main street branches in sub-streets. The main elements of these gardens are a pavilion, pedestrian grids, water fountain, conifer trees and agricultural fields. The Birjand's gardens have two principal axes, one is the northern-southern main walkway, and the second under the position of the main building has an eastern-western direction (Ranjbar, Mehrabani Golzar & Fatemi,

2005). These four gardens (Akbarieh, Rahim Abad, Amir Abad, and Bahlgerd) have no water stream in the middle of the main path, and hence the consideration of the viewer is more concentrated on the marginally tall pines (*Pinus eldarica*) and cypress (*Cupressus sempervirens*) as well as to the focal point of the way which is the pavilion (Ranjbar et al., 2005). The main walkway of the Rahim Abad and Amir Abad historical gardens is divided into three sections, the middle section for formal movements, and the two side paths for functional-agricultural applications. Most of the original plant cover of Bahlgerd garden has been demolished, either the principal ornamental and tall constructive trees or fruiting edible species. So contrary to the other cases, where the dense planting order controls the visual-spatial connection of the viewerscenery, in this garden, most paths are open from both sides.

Masoumieh garden is located in 3 km of the Birjand. Historically speaking, this garden dates back to *Pahlavi* dynasty. It was registered as the Iran's National Heritage in 2005.

Due to the registration of the Akbarieh garden a World Heritage Site in 2011, it has a special significance in this city. The construction of the Akbarieh as a complex was started in the late Zandiye era and continued in Qajar and early years of Pahlavi era. This garden involves absolute regularity geometry and is considered as an excellent example of Iranian gardens (Saberifar et al., 2015).



Figure 2. Boundary of Akbariyeh garden and its position in urban context, The National Base of Persian Garden Office (NBPGO) 2011: 35

Akbariyeh garden was built 5km from the center of Birjand and functioned as a resting place. The selected vegetation includes several indigenous species. Due to frequent severe water shortage, water was stored in basins to be used when needed. Ceramic elements were inserted into the slope to slow down the water and prevent soil erosion. Water enters under the garden and fills a basin which is divided into two branches that irrigate the trees through subsidiary canals. The buildings featured in this garden are the main entrance and other buildings added to the complex in subsequent periods. The book of The National Base of Persian Garden Office (NBPGO) declare that the presence of exotic plants and rows of pine instead of cedar trees along the main axis are particular features of this garden (NBPGO, 2011). In fact, Akbaryeh is representative of South Khorasan Gardens in its architectural design, planting, and water system.

### **Pahlavanpour Garden**

Pahlavanpour is a Qajar garden which was constructed in the Mehriz territory (not far from Yazd), a city in the center of Iran. The main structural plant of this garden is the plane trees (*Platanus orientalis*), and its primary fruit is pomegranate (*Punica granatum*). The plane trees have been planted on both sides of two water streams which longitudinally pass from both edges of the principal axis. The main axis of this case has two side walkways at the lower level which are drawn along the edge of pomegranate beds. Also, this World Heritage Site is similar to the Birjand's gardens concerning the lack of the main water canal in the middle of the central axis.

Thanks to the abundance of water, this garden enjoys abundant vegetation. A *qanat* supplies water: it enters the garden and flows through a watermill, fills a basin, passes through the gutters then goes along the main axis of the garden before flowing again into a watermill, from which it irrigates the surrounding fields. The buildings are grouped into the winter and summer residence complexes and include subsidiary structures. Among the particular elements of this garden are the link between the water and the mansion (the main brook passes through the mansion) and the presence of two watermills which reap the benefits of hydraulic power. Pahlavanpur garden exemplifies the Persian Village Garden pattern, where traditional garden meets modern landscape (NBPGO, 2011).





Figure 3. Plan of Pahlavanpur garden (NBPGO, 2011: 32)

## Fin Garden

Fin garden (7.60 ha) is the World Heritage Site, and is located at the edge of the Iranian desert, near Kashan, is the sixteenth-century garden, and both its architecture and landscape continue to be dependent on the water (Ruggles, 2008). Fin contains numerous cypress trees and combines architectural features of the Safavid, Zandiyeh and Qajar periods. The central plant element of the garden is cypress (*Cupressus sempervirens* var. *fastigiata*). Despite the improvements through architectural restorations, the plant density of Fin famous historical garden is being demolished, especially after the severely cold winter in 2007 (IRAN's National Botanic Garden, 2014). Before 2009 the massive quince trees (*Cydonia oblonga*) filled the agriculture beds, but after elimination, lawns were planted on the surfaces of the beds which created a non-genuine scenery which is inharmonic to its Persian originality (Jeyhani & Omrani, 2008; IRAN's National Botanic Garden, 2014).

Fin is located in an arid region delimited by mountains on one side and desert on the other. The garden has an approximately quadrangular shape with the pavilion being at the intersection of the two principal axes. The pool is situated northwards, from which the main waterway originates. Water at Fin is supplied by a spring 3 km south of the garden. Here the water is divided into two branches, one supplying the water mills and the other feeding, via two artificial springs, the main and subsidiary water bodies of the garden, before heading out to the surrounding farms and fields. Water in the garden is sent to three main areas where the natural properties of gravity, water speed and pressure are used to create special effects, along with the aid of man-made features such as ponds, fountains, channels, hidden ducts and water tile pipes (NBPGO, 2011).

The planting of dense rows of cedar trees along the principal axes has given the garden an apparent order and spacing and a compactness which is particular to Fin Garden. Subsidiary walkways contradict this feature and give a sense of openness to the garden. Tall trees at the boundaries separate the garden space from the exterior and help create a micro-climate favorable to the growth of fruit-trees and flowers. The particularities of this garden include its pre-Islamic origin, the ancient and highly developed water system, the organization of the vegetation, the use of cedars, its asymmetry, and the building materials used for the structures (NBPGO, 2011).

Fin garden exhibits significant elements of the Persian Garden pattern, organization of waterworks, old vegetation and architectural and artistic elements.



Figure 4. Map of Fin garden (NBPGO, 2011: 161)

## Dolat Abad Garden

The Dolat Abad Garden (8 ha) was built about 1750 in Yazd, which is the capital of a province in the center of Iran. Also, the Dolat Abad garden renowned for having the world's tallest wind tower that stands over 33 meters. The pine trees (*Pinus brutia*) provide shade over the central walkway of this World Heritage Site. In the Dolat Abad garden, in contrast to the Fin, the fruit trees' landscape has not yet been converted to non-genuine decorative greenery. But most surfaces are still vacant where rehabilitation and reconstruction are being projected.

The garden is rectangular in shape and is articulated along a strong east-west axis with flowerbeds divided by brooks. The garden served as a fruit and governmental garden, with a

summer and winter residence. The water was supplied by Dolat Abad Qanat, which reaches the garden from behind the summer mansion and fills a basin from which the water is divided into two branches. One of the distinguishing features of this garden is the wind-catching structure and several water basins and jets. Dolat Abad possesses a complete layout among surviving Persian Gardens (NBPGO, 2011).

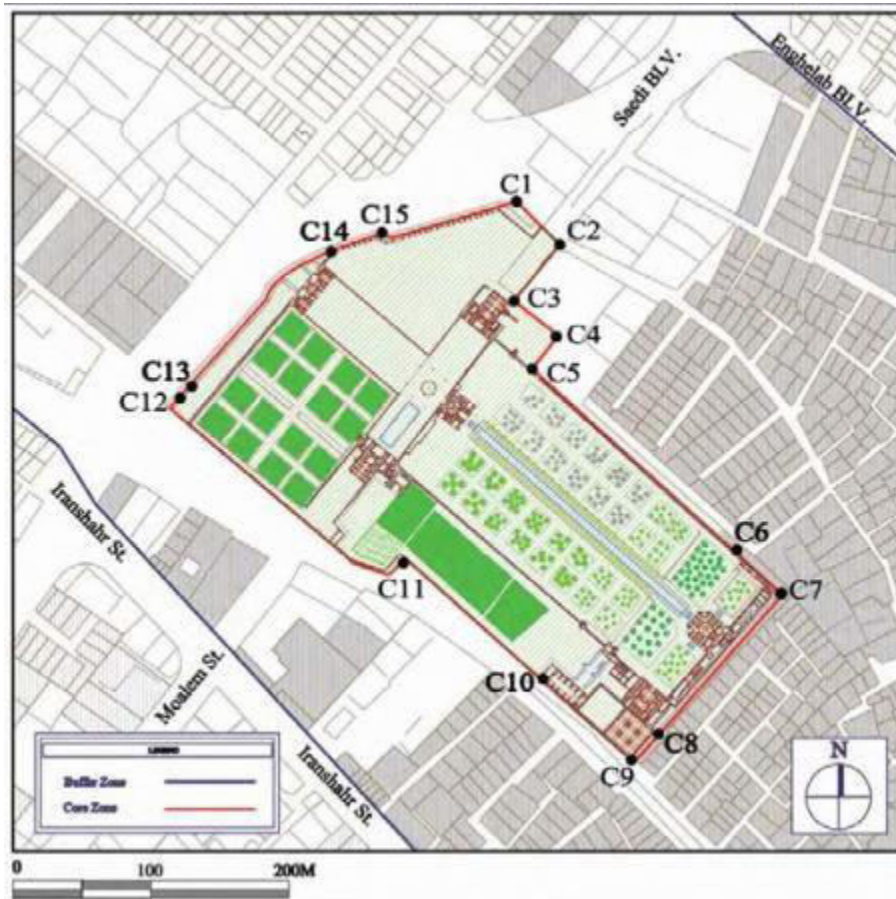


Figure 5. Plan of Dolat Abad garden (NBPGO, 2011: 29)

## Shahzadeh Garden

Shahzadeh garden is the other World Heritage Site in this study, with its marvelous terrace gardening in a sloping bed, which could enrich the relationship between the spectator and the scenery. This garden was built during the Qajar reign (1819 century CE) and remained unfinished as its founder died. It was subsequently subdivided and neglected for political and social reasons and suffered much damage. The first conservation work started in 1959, and the garden was listed

on the List of National Heritage in 1975. In 1981 an earthquake inflicted severe damage, and preservation work had to be carried out again in 1991 (NBPGO, 2011).

The main pavilion was positioned on the highest terrace and the entrance building on the lowest one. The spatial experiences in this garden, based on various viewpoints, are distinct and clearly perceived. (Abar-Dasht Consulting Engineers, 2003). Currently, some of the agriculture landscape in the back of the main pavilion has been converted into the decorative greenery. Also, planting marginally decorative plants around the fruiting beds, by contrast to the original design, creates a barrier to the scenery, which disconnects the visual continuity for the viewer.

The garden has an elongated rectangular shape and is structured along a longitudinal axis which intersects the main entrance and the pavilion, which is the only building inside the garden, the others being located along its perimeter. A high composite wall completes the enclosure. The internal organization of the garden is based on flat steps laid along the main axis, corresponding to the typology of *Takht* (step) gardens. The vegetation collaborates to build a refined design, in which the arrangement of different types of tree and shrub forms accurate patterns of shade and seasonal colors. The longitudinal axis and topography are also highlighted using brooks and a series of small cascades along the stepped slope. The particular features of this garden are the innovative irrigation system, which coupled functional and aesthetic goals, and its desert setting. Shahzadeh exemplifies the *Takht* Persian Garden model, created in an extreme climate with the help of innovative irrigation methods and the functional and aesthetic use of water (NBPGO, 2011).



Figure 6. Plan of Shahzadeh garden (NBPGO, 2011: 26)

## Chehel Sotun Garden

Chehel Sotun (5.80 ha) is a pavilion garden. The principal axes of the garden go from west to east, and plain trees have been planted along them. The pool is the most important manifestation of water here. The garden dates back to the Safavid epoch, and the construction of the palace inside it seems to have been completed in 1674 AD, after two subsequent building campaigns. Documented conservation work date back to the second half of the 20<sup>th</sup> century. Chehel Sotun was chosen by UNESCO as the World Heritage Site because of its magnificent architecture and water system, garden landscaping and arrangement of plants (NBPGO, 2011).



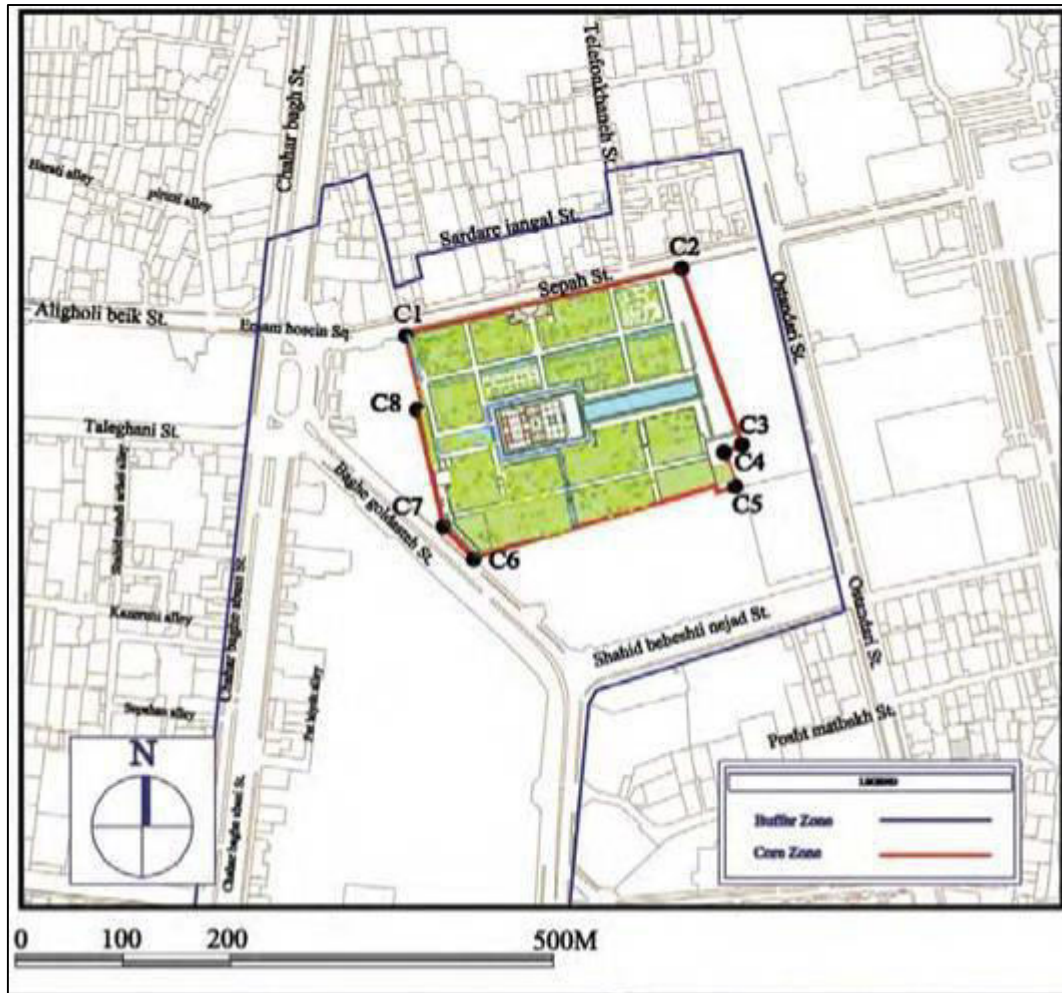


Figure 7. Chehel Sotun garden boundary (NBPGO, 2011: 16)

## Abbas Abad Garden

Abbas Abad (420.20 ha) is an example of the Persian Garden model can be adapted to a humid climate, and dates back to the Safavid epoch. The garden complex is located amid a forest, in northern Iran. The *Chahar Bagh* compound is the source of water for the entire garden, due to its relatively elevated position. The water runs through a system of pipes, canals, and basins, and the flow is maximized by exploiting the slope, gravity and water pressure. The plan and features of this garden are unlike those of any other Persian Garden especially considering the culmination of waterworks engineering, represented by the interconnected system of the dam, the network of underground channels and pipes, the *Chahar Taqi* and the towers with their safety function.

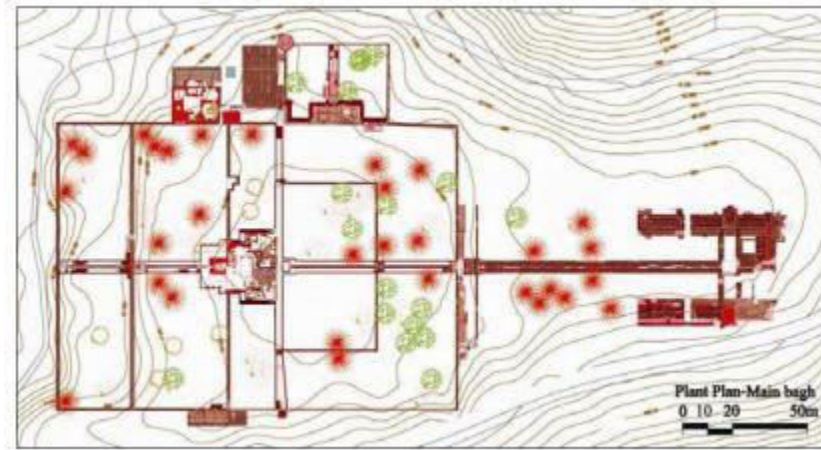


Figure 8. Plan of Abbas Abad garden (NBPGO, 2011: 205)

## Golshan Garden

Golshan Garden is located in Tabas in East of Iran in a desert context. This garden was registered as a national heritage of Iran in 1977. Golshan Garden has permanent running water is still flowing. The shape of this garden is square, and from the viewpoint of vegetation includes palm, orange, and much other different fructiferous.



Figure 11. Plan of Golshan garden (Honarsaraye Memari Yazd Consulting Engineers, 2011: 58)



## **Chapter 2 : A Review of the Main Concepts of Integrating Agriculture in Public Landscapes and Open Spaces<sup>1</sup>**

In this chapter we will review the main concepts supporting theoretical and practical food production as a land use in city and landscape planning and design. Considering the main projects that have been conducted and successfully executed demonstrates that they could be categorized into four distinct groups of concepts: multifunctionality, productive landscape, recreational agriculture, and participatory landscape. The concepts overlap but each of them has particular attributes, which distinguish them from each other.

The concept of multifunctionality has two main aspects: integrating agriculture into recreation (multifunctional urban landscapes), or integrating recreation into agriculture (recreational multifunctionality). The concept of productive landscape is represented by “Carrot City”, a concept for introducing productive urban landscapes (including garden parks, multipurpose plantations, and edible landscapes) educational-productive squares, and productive streets into cities as essential elements of sustainable urban infrastructure. The intersections of agriculture, recreation, and leisure are at the core of the concept of recreational agriculture, which has two branches: agrileisure and agritourism. The last concept (but not the least) is participatory landscape, which encourages authorities and policy makers to invite citizens to participate in public landscape management and maintenance under particular models such as allotment gardens, community gardens, and public-access community gardens.

Urban agriculture (UA) has been defined as the growing of plants and the raising of animals within and around cities, to provide food products from different types of crops and animals, as well as non-food products such as aromatic and medicinal herbs, ornamental plants, and tree products (Food and Agriculture Organization of the United Nations 2015). While the impact of UA on urban diets and income creation cannot be overstated, urban agriculture has become an attractive land use because of its potential to address multiple needs, supplying fresh produce in neighborhoods with limited access to healthy food while offering opportunities for employment, education, and recreation (Taiwo 2014). As planners, public health officials, and community

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<sup>1</sup> This chapter has been presented at the *6<sup>th</sup> International AESOP Sustainable Food Planning Conference* in Leeuwarden, Netherlands (November 2014).

groups alike articulate the linkages between food systems, health, and the built environment (Corburn 2009; Pothukuchi 2009), locating possible sites for urban agriculture has become a priority (McClintock, Cooper, and Khandeshi 2013).

It shows that the multidimensional identity of urban agriculture could be studied from several viewpoints. Land use policy-makers' particular perspective is to assess, evaluate, and survey the potential, suitability, and accessibility of urban land for agricultural purposes (Maxwell 1996; McClintock, Cooper, and Khandeshi 2013). On the other hand, environmentalists concentrate on the potential environmental and health risks of urban agriculture (Säumel et al. 2012), waste recycling issues (Parrot et al. 2009), and the beneficial effects of farming for the urban environment (Brock and Foeken 2006).

In addition, the landscape applications of urban agriculture is an interesting issue for landscape planners, green space architects, and the relevant authorities in municipalities and urban planning departments. It is, therefore, the object of this paper to review the main concepts supporting food production as the main land use at the city scale, or as a significant activity and use of space at the park level.

## **Concepts of integrating agriculture in the landscape**

Despite the fact that food production, processing and consumption together constitute perhaps the most basic aspect of resilience for human communities, recognition of this has been slow in the urban and landscape design and planning professions (Lee-Smith 2009).

The (potential) benefits of urban agriculture regarding social impacts, health improvement, community building, poverty alleviation, and environmental improvement are already fairly well covered in some publications. Many of the papers in urban agricultural environment research are published in the contexts of land use policy, environmental issues, food production, and social aspects of this phenomenon.

Although the scientific resources on the subject of the integration of urban farming are scarce in the disciplines of landscape and urban design, urban forestry, urban greening, and landscape research, some other experiences could reinforce the spread of this idea. Beyond the small body of

published literature specifically on the topic, descriptions of projects where farming was applied in urban landscape planning and design could also be utilized. So, the concepts and experiences that support the development of landscape with an agricultural perspective will be reviewed. Four main concepts are supporting the incorporation of agriculture and food production into the public landscape and open-space development. These are the concepts of Multifunctionality, Productive Landscape, Recreational Agriculture, and Participatory Landscape.

## **Concept of Multifunctionality**

### **Multifunctional urban landscapes**

This concept says that open and green urban spaces can be designed for multifunctional urban agriculture, and can combine natural habitat, food production, and educational, recreational, and leisure activities (Dubbeling 2011). Barkmann et al. (2004) define multifunctionality of the landscape as the phenomenon that the landscape actually or potentially provides various materials and immaterial “goods” to satisfy social needs or meet social demands.

Rural landscapes are often multifunctional, meaning that at a single location, different goods and services are being provided (Willemsen et al. 2010). But in cities, the high costs of managing open green space dominate the thinking of many planners and authorities, even though a more multifunctional approach or public-private partnerships can help to reduce costs (Drescher, 2005). Focusing primarily on London, Viljoen, Bohn, and Howe (2005) make the point that by combining urban development planning with proper design of a “productive green grid”, tens of thousands of people could be fed from local agricultural produce, while benefitting at the same time from a pleasant landscape offering opportunities for leisure and recreation.

Productive multiple uses of urban green spaces is an ongoing project in Bobo-Dioulasso, Burkina Faso, where the municipality promotes urban agriculture and forestry as a climate change adaptation strategy. In this project, introduced by Sy, Baguian, and Gahi (2014) in *Urban Agriculture Magazine*, multifunctional use of greenways was undertaken as an adaptation strategy to preserve and protect the border zones between the city and its forests, and to maintain the greenways as areas of multifunctional and productive land uses. A particular section of greenway,

covering several hectares, was chosen as a pilot project and designed for the functions of forest production, market gardening, and development of recreational and environmental education areas.

So, under the concept of multifunctionality, cultivated urban space serves the needs of both the agricultural and urban populations, each of them still retaining their value systems. The multifunctionality of (urban) agriculture arises from its ability to produce both agricultural commodities and a useful area for the city; it preserves urban open spaces through agricultural activities or projects. As soon as open spaces are appreciated inside cities, agriculture is welcome, especially because it provides green areas in the city without (high) public expenses.

The periurban valley of the Bou Sellam wadi in the Setif area of Algeria has a clear recreational and productive function. The urban project described by Boudjenouia, Fleury, and Tacherift (2005) includes agricultural use as one of the principles of open space conservation and natural spaces, and meadows are effectively utilized by the inhabitants for leisure and recreation. In addition to the current diversity of its functions (recreation, landscape, production, irrigation, and so on), greenbelt is a new feature that could be added to the Bou Sellam wadi valley.

The integration of agriculture in urban and periurban land uses is one of the most important aspects of multifunctional agriculture. For example in Casablanca, Morocco, some defined five-year pilot projects that were started in June 2008 are outlined in subsequent table, based on the study of Martin Han and Pieschel (2009). As the table 1 shows, while agriculture is a distinct land use, it could also be integrated into other land uses, to acquire the multi-dimensional benefits as well as helping to correct the single land use pattern. So, improving the aesthetic dimension of industrial plants could be conducted by reusing the wastewater for agricultural purposes. Or, while the installation of a green school garden might improve children's nutritional status, it is also an opportunity to teach them about urban farming.

*Table 1. Integration of agriculture in urban and periurban land uses in Casablanca, Morocco. (Based on Martin Han and Pieschel, 2009)*

Integrated Parts	Place	Details / Description
Industry and urban agriculture	Airport	Re-use of wastewater for agricultural purposes and improving the esthetic dimension of industrial plants
Informal settlement and urban agriculture	Village and school	Installation of a green school garden to improve children 's nutritional status and to teach them to grow agricultural products in urban settings
Periurban tourism and urban agriculture	Valley	Synergies between agricultural production and short-distance recreation and tourism; conservation of periurban multiple open spaces and natural heritage
Healthy food production and urban agriculture	Pedagogical organic farm	Developing culture/healthy lifestyle approach to food production, an economic-solidarity partnership between food producers and urban consumers.

## **Recreational multifunctionality**

Recreational multifunctionality is understood as any recreational service provided by the farmland to household members, their visitors, neighbors, and the public with or without any economic gain (Barbieri and Valdivia 2009; Barbieri and Valdivia 2010). Traditionally in the USA, farms have been perceived as a source of leisure and recreational opportunities for household members and outsiders (Barbieri and Valdivia, 2010). In this context, recreational multifunctionality was developed to examine the role of recreation in the rural landscape and to contribute to the overall understanding of the multiple functions that agriculture provides to society beyond the practice of farming.

Results from Barbieri and Valdivia's (2010) study show that family farms provide recreational services to society and rural communities, along with the provision of food and fiber in Missouri. The most frequently provided services were hunting (72.2 percent), a gathering of wild edibles such as mushrooms or berries (64.6 percent), wildlife observation or nature contemplation (56.7 percent) and walking or hiking (53.5 percent), demonstrating a blend of consumptive and non-consumptive recreational uses. These results suggest that in addition to other societal benefits that

farms can provide (such as conservation of habitat and biodiversity and preservation of rural heritage), those associated with recreational services should also be recognized.

The associations found in this study are important because they suggest that agroforestry practices can also favor another use of the land—recreation—as an additional benefit that should be recognized and assessed when examining the overall benefits of incorporating trees and shrubs into agricultural production. Also, those promoting the adoption of agroforestry practices should communicate these associated recreational benefits, especially to those landowners who are not primarily dedicated to commercial agricultural production, including non-farming landowners. Enabling a greater recreational use of the land and recognizing this use are important because recreation produces a myriad of benefits to landowners, communities, and society as a whole—direct advantages of strong multifunctionality.

## **Concept of Productive Landscapes**

### **Continuous productive urban landscapes (CPUL)**

Under the concept of CPUL, urban agriculture—just like roads and energy systems—should be considered as an element of “essential infrastructure” within sustainable cities. The big advantage of urban agriculture over other elements of infrastructure is that it offers some ancillary benefits at no or low cost to the city.

In their seminal book *Continuous Productive Urban Landscapes: Designing Urban Agriculture for Sustainable Cities* (Viljoen, Bohn, and Howe 2005), the authors defined CPULs as a coherently planned combination of connected open urban spaces which include areas for urban agriculture and ecologically productive landscapes. CPULs may be thought of as a new kind of extended public park, integrating traditional recreational and leisure facilities with areas devoted to urban agriculture, fields, ecological corridors, and routes for cyclists and pedestrians. CPULs aim to be productive regarding economics (food production), sociocultural status (quality of life) and the environment (reduced carbon dioxide emissions, improved biodiversity and air quality, and the provision of heat island sinks).

CPUL concepts were integrated into the plans for the London 2012 Olympic Games: recognizing his research and expertise, André Viljoen was invited to consult with teams designing

the Olympic Park and venues for their uses both during the games and afterward. He stated that “London 2012 aims to be the greenest Olympic and Paralympic Games to date. Just as important is the ambition to secure a green legacy for future generations in East London.” (University of Brighton 2013)

Furthermore, it should be mentioned that beyond productive landscapes, nowadays Viljoen and Bohn (2014) and Gorgolewski, Komisar, and Nasr (2011) speak of “Carrot City” as the productive city, a concept for introducing productive urban landscapes, including urban agriculture, into cities as essential elements of sustainable urban infrastructure. The Carrot City website/repository tracks and documents the initiative’s progress and case studies (Ryerson University 2009).

### **Garden parks**

Dubbeling (2011) defines garden parks as larger public green areas in which recreational, productive, educational and commercial activities are developed. Designs should integrate playgrounds and areas for leisure and sports, with areas set aside for vegetable and fruit production and others for medicinal and ornamental plants. Garden Park is an urban agricultural concept for the use of vacant urban land in Rosario, Argentina (Lattuca et al. 2005). Under this concept, agriculture and public recreation are integrated as “nature belts” at the borders of roadways and waterways, or they are located in the midst of other urban infrastructure systems that offer empty spaces.

Based on Lattuca’s model, garden parks could put the use of streams and their basins into a broader context, by considering not only the aesthetic and environmental value of the resources to be protected, but also their socioeconomic (productive) value. From the productive point of view, a high percentage of flood plains are not suitable for intensive agricultural production or the installation of technical structures. These areas can, however, with little or no modification, sustain less intense activities or become recreational areas with minimal investment and maintenance.

Since garden parks are artificial agroecosystems, trees, bushes, and aromatic, medicinal, and other plants can be included in their design, to provide multiple benefits: ornamental, environmental, nutritional, and medicinal, in addition to protection from wind and rain, nutrient recycling, a refuge for birds and insects, and so on. Aromatic trees and bushes are recommended because of their beneficial effects on the environment, and trees and shrubs of the Fabaceae

(leguminous) family are recommended due to their addition of nitrogen to the ecosystem. Trees and shrubs should be located around the perimeter of each garden park, forming a living fence and serving as a biological barrier for the protection and preservation of the entire agroecosystem.

The mere possibility of transforming degraded spaces into environments that can be put to productive use by low-income families, looking for solutions to their daily problems, is already a strong validation of the worthiness of the effort. Also, the possibility for social integration presented by the combination of these collective activities, including the public and recreational use of the spaces, represents a concrete and viable opportunity to promote values of solidarity and to recognize the diversity of social status and life opportunities that characterize a city like Rosario.

### **Multipurpose plantations and edible landscapes**

Historically speaking, the agricultural landscapes of Islamic gardens are examples of the traditional edible landscape (Ruggles, 2008) that are alive and active in Persian gardens of Iran. Nine of Iran's Persian Gardens were registered in 2011 by UNESCO as World Heritage Sites (United Nations Educational Scientific and Cultural Organization, 2011). The authors' survey of some of them shows that beyond the attractive landscape that is the structural green space, traditional gardening and Iranian environmental design also provide productive landscapes by devoting the majority of garden area to edible plants.



*Figure 9. Incorporation of fruitful plants (grapes in the foreground) with ornamental species (cypress in the background) in Dolat Abad Persian Garden (World Heritage List) in Iran*



In The Netherlands, a large area of fruit tree orchards with a grass ground cover was functional, but with the addition of a multipurpose plantation design, it bears some new characteristics, such as an attractive landscape, biodiversity, and recreation.

Oosterbaan (2004) described a project located in the surroundings of Winterswijk City (the Netherlands), where eight farmers and estate owners established 10 hectares of such multipurpose plantations. The trees (mainly walnut) were planted, 10–20 meters apart, in pastures. On two farms (already involved in agritourism), fruit shrubs (red, black, and white currant; blackberry, raspberry, gooseberry, hazelnut, and quince) were planted in otherwise unprofitable corners, to enhance their attractiveness to tourists.

The core of “multipurpose plantations” is multipurpose trees and versatile crops, preferably interacting in a positive way. Multipurpose trees deliver a variety of tangible products such as fruits, leaves, bark, twigs, timber, roots, and materials for medicine or other uses. Crops are in general less multipurpose than trees, but some species can also provide different products, directly or indirectly. Mixed grass/flower cultivations deliver not only fodder, but also greater biodiversity, and contribute to aesthetically pleasing landscapes.

The periurban zone is a good place to establish multipurpose plantations since this system of horticulture delivers a broad range of environmentally friendly products. Production processes and products are available and visible to the urban citizens. The most suitable location for multipurpose plantations is the transition zone between open landscape and dense forest area, but the peripheral zones of small forests should also work well.

Beyond the developed countries, cultivation on idle or undeveloped land in urban areas is also very widespread in the Pacific Islands and provides a primary source of produce, including limited commercial crops. Along road frontages, fruit trees such as mangoes and coconuts are common but ornamental, and shade trees dominate, many of which are systematically planted by city councils or the government, as well as by individual households. Living fences of fruit trees and other useful species are harvested, pruned, pollarded, or “grazed”, and constitute important sources of food, fodder, firewood, medicines, and flowers, as well as being of considerable ecological importance (Thaman 2004).

Bhatt (2005) believes that providing urban edible landscapes should involve setting new principles for urban design and planning that include food security and urban land-use considerations: planting occurs in public spaces, but in these neighborhoods (low-income settlements) there is no one responsible to tend to it, and soon after residents move in, the planting starts to wither. Obviously, local officials responsible for such initiatives see landscaping as a luxury that is appropriate only for high and middle-income residential developments.

In Kampala, Uganda, an “edible neighborhood” has been designed as part of the “Making the Edible Landscape” project. Specific conditions for housing and plot design have been proposed to maximize the potential for growing. Cities like Vancouver (Canada), Colombo (Sri Lanka), Kampala (Uganda), Rosario (Argentina) and Dar es Salaam (Tanzania) are experimenting with the inclusion of space for home and/or community gardening in new public housing projects and slum-upgrading schemes. The government of Jordan is now considering rewriting national building codes to ensure that all future residential construction makes use of gray water reuse systems. In the attempt to design open spaces for edible landscapes, other types of productive green structure are also being considered, such as educational–productive squares and productive streets. (Bhatt 2005; Dubbeling 2011)

Educational–productive squares are neighborhood squares designed for recreational, productive, educational, cultural, and possibly commercial uses. So, their structure and function will respond to community needs for playgrounds, social meeting places, urban greening, and production. Productive streets are designed to integrate small-scale productive activities, community meeting spaces, processing and marketing activities as well a productive green structure (for example fruit trees). These activities will enhance the street’s potential as a space for social interaction, without obstructing the normal traffic and pedestrian flow.

## **Concept of Recreational Agriculture**

### **Agrileisure**

According to Amsden and McEntree, agrileisure emerges from the intersection of agriculture, recreation and leisure, and social change, binding both the supply and demand sides of farmbased

recreation and tourism through processes of economic diversification, community development, and environmental and ecological sustainability. (Amsden and McEntree 2011: 38)

A major distinction between agrileisure and agritourism is that most participants in farmers' markets and community-supported agriculture (CSA) are not tourists; rather, they have engaged community members with a keen interest in food, agriculture, community development, and/or the social experience (Farmer et al. 2014). Farmer's study provides implications and direction for parks and recreation professionals (and others) who are working to alleviate food insecurity through their programs; agrileisure services could assist in this effort.

Farmers' markets and community-supported agriculture (CSAs) offer consumers a host of benefits including access to fresh, high-quality, locally grown food; the opportunity to educate themselves about how the food was produced, through interactions with farmers; and valuable recreation and social activities that provide possibilities for developing stronger relationships in their community, either through attendance at the farmers' market or participation in a CSA.

Spatially speaking, farmers' market participants lived significantly closer to a market than those who did not shop at the market. The location is critical for access to recreational venues, as suggested by the GIS analysis of the distribution of urban public trails in Indianapolis (Lindsey, Maraj, and Kuan 2001). The authors noted that marginalized populations have less access and are often located in segregated areas away from these vital features that act as both recreation venues and transportation corridors, similar to the finding that farmers' markets are often found in higher-income, more affluent areas (Markowitz 2010). Farmer's 2014 study also supports the results of the Project for Public Spaces (2013). Sherriff (2009) highlights the importance of positioning local food distribution venues within areas where individuals may find a geographical fit. Park and recreation agencies responsible for facilitating community farmers' markets or other agrileisure experiences must consider their physical placement to ensure access and participation.

### **Agrotourism**

Agrotourism is a combination of agricultural production and tourism activities that encourages citizens and tourists to visit farms or rural fields for a variety of purposes; the resulting enjoyment, education, and/or active involvement in the activities of agricultural production and farming life have been mentioned by Yang, Cai, and Sliuzas (2010). Establishing linkages between tourism

(demand for food) and local agricultural production is critical in maximizing the host country's benefits (Torres 2003). In fact, agrotourism is a form of commercial urban agriculture, and the recent development of its enterprises in periurban areas offers a means to promote integrated urban and rural development in a manner that can counteract some of the negative impacts of urbanization (Yang, Cai, and Sliuzas 2010). But agrotourism is not dependent merely on agricultural fields; beyond agriculture, in some countries such as England, garden tourism is popular, and many gardens are open to the public. Lipovská (2013) states that visiting small private gardens satisfies people interested in gardens as well as those who are simply looking for a pleasant day out or a way of spending time with their friends or family.

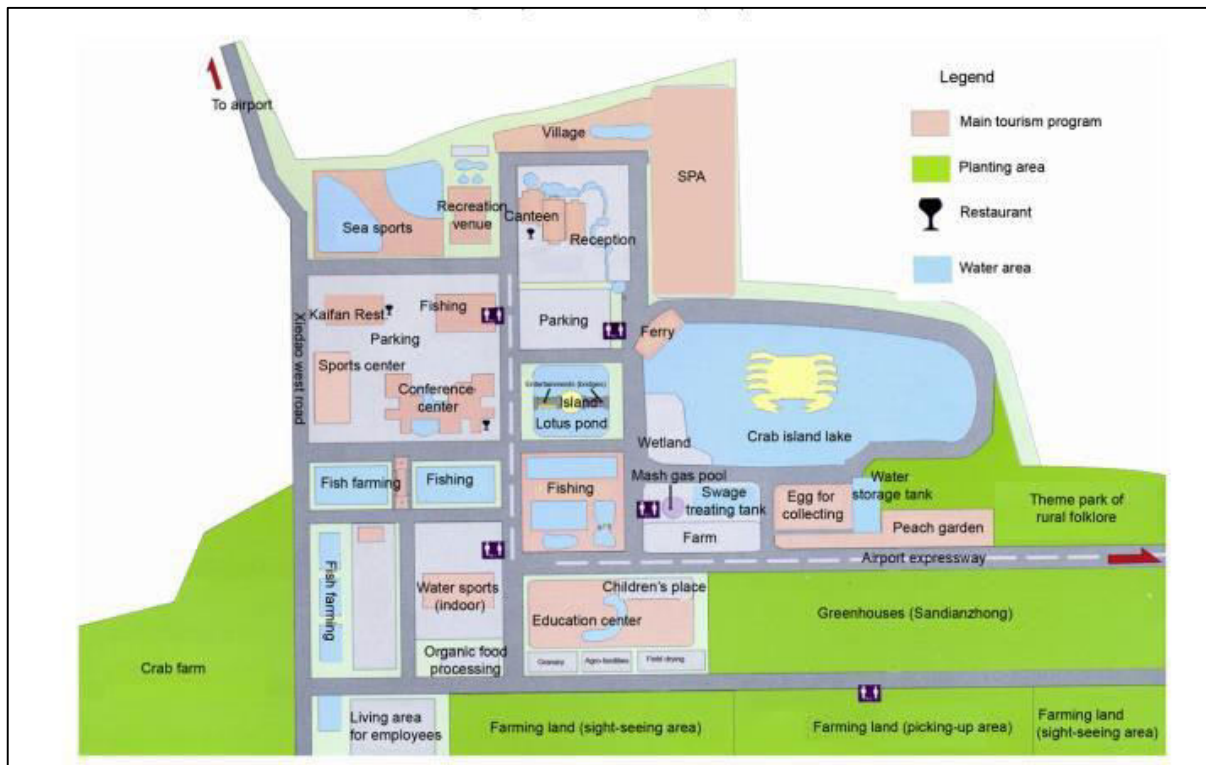


Figure 10. Sketch of agricultural production and tourism activities in Xiedao Green Resort (China) in which the ration of land use for agriculture and tourism is 9:1. In the agricultural land, about 27 ha each for rice and vegetable, 40 ha for wheat, 20 ha for corn, 6.5 ha for fruit trees, and 20 ha for fishery (Yang, Cai, & Sliuzas, 2010: 379).

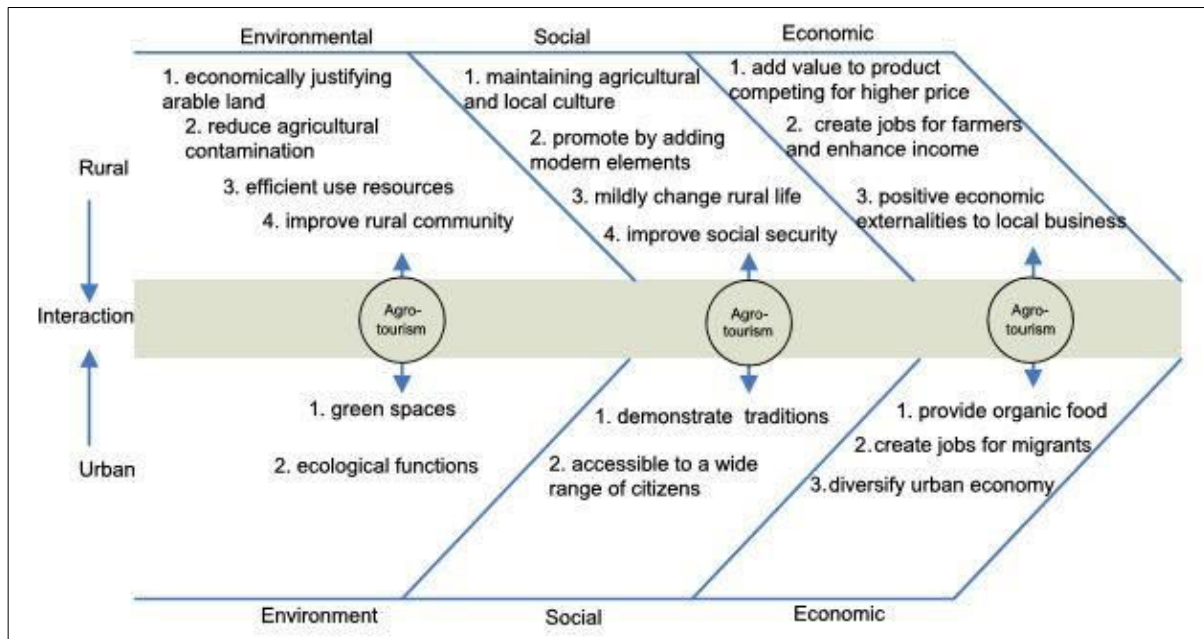


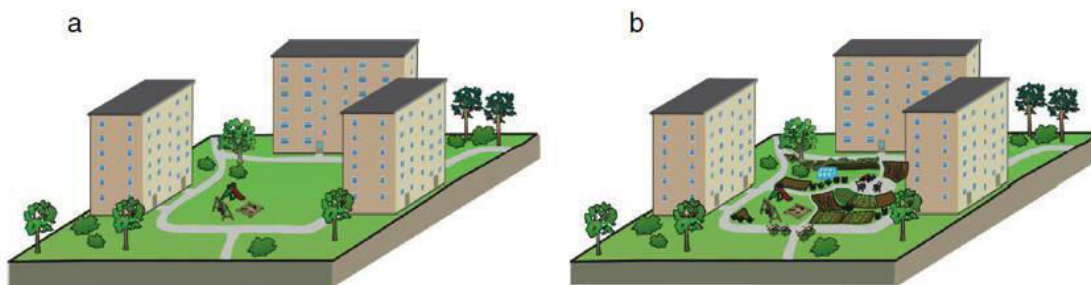
Figure 11. Multi-functional agro-tourism in integrated urban and rural development (Yang et al., 2010: 383)

## Concept of Participatory Landscape

This concept encourages authorities and policy makers to invite citizens to participate in public landscape management and maintenance. Some particular green space models such as allotment gardens are examples of collective green space management (Colding and Barthel 2013). Well-known in the United Kingdom and Sweden, and sources of resilience in Cuba, allotments are sites for the non-commercial growing of food and flowers, rented to individuals by local authorities, and primarily originated as a response to food shortages during the transition from feudal agrarianism to urban industrialism. The other experienced model of the participatory landscape is community gardens, “open spaces which are managed and operated by members of the local community in which food or flowers are cultivated” (Kingsley, Townsend, and Henderson-Wilson 2009). In contrast to the more formal character of allotment gardens, community gardens are more unstable club realms, often representing an interim use for vacant land awaiting construction. The study of Armstrong (2000) revealed that the most commonly expressed reasons for participating in community gardens in upstate New York were access to fresh foods, enjoying nature, and health benefits.

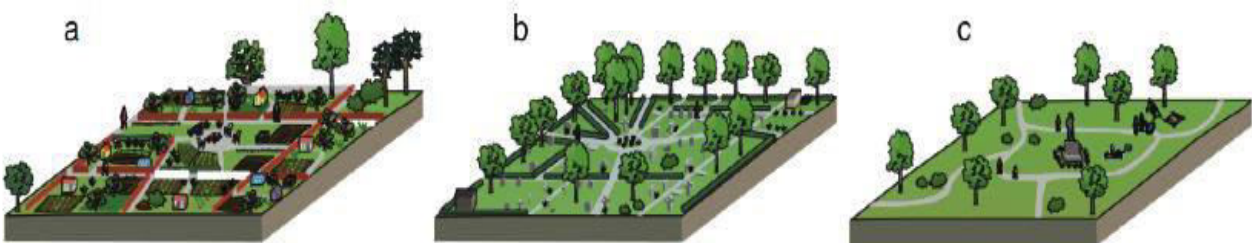
Public-access community gardens (PAC-gardens) are a particular type of urban community garden in Berlin, Germany, featuring a high degree of openness for the public to participate in the management of urban green space. They are open to anyone at all times, collectively managed by various interest groups in civil society, and in which formal obstacles to immediate participation by the public are absent or low (Bendt, Barthel, and Colding 2013). These PACgardens encourage the consideration of community gardens as a strategy for the management of whole parklands.

Following figure shows how a traditional yard in a city could be transformed into a lush, biodiversity-rich garden where dwellers could collectively take care of and manage diverse micro-habitats, promoting a sense of place, social integration, and cognitive resilience-building in urban settings.



*Figure 12. Transformation of the traditional city yard into a productive garden (Colding and Barthel, 2013: 163)*

Following figure demonstrates the helpful effect of participatory landscape management on biodiversity promotion. Allotment area (a), the participatory landscape management site, resulted in higher pollinator abundance and held a different community structure of seed dispersing and insectivorous birds when compared with government-managed cemeteries (b) and urban parks (c).



*Figure 13. Effect of participatory landscape management on biodiversity promotion (Colding and Barthel, 2013: 163)*

## **Interim conclusions**

The initiative review revealed that little information currently exists on the characteristics or features of integrating urban agriculture in urban landscapes, especially from the design detailing point of view. Species used in urban landscape and forestry were chosen mostly for their aesthetic value or ornamental qualities, so there is a clear need to introduce more multipurpose trees in urban agroforestry as well as to implement concepts for designing urban landscapes based on agricultural points.

In summary, our main findings are these:

- The general concepts of integrating food production into public landscapes have been revealed through initiatives described in papers and books published over the past several years. Their ranges of ideas or executed projects can be categorized into four main concepts and themes.
- The four concepts overlap. Multifunctional landscapes could be productive, as well as providing recreational possibilities; recreational agriculture can be converted into productive spaces. But each concept has particular attributes which distinguish it from the others:
- The concept of multifunctionality: integrating several land uses into one place will increase the productivity of cities or landscapes by incorporating agricultural phenomena.
- The concept of productive landscapes: there is a current universal need to design public spaces which are productive as well as providing recreation possibilities and aesthetic value.
- The concept of recreational agriculture: agricultural spaces could be converted or redesigned to include public recreational activities. It will increase the appeal of production processes.
- The concept of participatory landscape: the traditional management and maintenance of green spaces could be promoted to participatory landscape management, which could

convert normal greenery into a source of food as well as provide other benefits, such as community building, education, and health promotion.

- Today, after several years' experience with productive and "carrot cities", it is evident that designers of public parks should consider the possibilities for agricultural activities and spaces in their planning and design activities. Furthermore, when rehabilitating degraded parks and green spaces, options presented in the following table could be incorporated.
- Each of the aforementioned concepts may occur at several scales (large, medium, and small) based on local needs and feasibility. The larger the scale, the more productive the result.
- As well as new achievements and contemporary experiments, historical tradition and roots are also vital. Islamic landscapes and gardens are among the main models to be studied and utilized, concerning the practice of specifying the landscape area with edible zones as well as the esthetic ones.
- The design of urban agriculture details and standards are also critical for disseminating the main concepts. General aspects and theoretical considerations have been well documented, but design details and criteria are also a vital resource for landscape designers to be able to plan practical and trial projects, especially in countries that have no contemporary experience of the main concepts outlined in the consequent table.
- It is recommended that some of the pioneer countries in urban agriculture (the Netherlands, Canada, and Germany) invite professionals from foreign countries to convey successful experiments and models to the less-experienced regions.



*Table 2. Agricultural activities and productive spaces proposed for the public parks (Based on Gorgolewski, Komisar, and Nasr, 2011)*

Main activities and spaces	Details
Agricultural lands	Orchards
	Vineyards
	Annual and perennial crops
	Livestock
Children 's land	Children 's garden
	Children 's planting beds
	Children 's demonstration garden
Organic restaurants	Eating area
	Dining tables
Green structures	Roofs, facades, balconies, terraces of public and administrative buildings
	Edible fence
Educational landscape	Educational programs' space
	Horticulture center
	Greenhouses
	Workshop space
	Kitchen classroom
	Demonstration garden
	Innovative gardening space
Market space	Retail garden center

*Table 3. Possibilities for integrating the four concepts of food production into public landscapes, at three scales (Based on Gorgolewski, Komisar, and Nasr, 2011)*

Concepts	Scale	Possibilities
Multifunctionality	Large scale	Urban infrastructures
		Highways, rail lines, pedestrian paths, cycling trails, roads
		Greenways and greenbelts
		Natural meadows
		Periurban regions
Productive landscape	Medium scale	Urban parks
		Rural parks
		Agroparks
		Community gardens
		Vertical farming
Recreational agriculture	Medium scale	Edible streetscape
		Schoolyards
		Edible campus
		Rooftop gardens
		Garden parks
Participatory landscape	Small scale	Educational productive squares
		Edible fences
		Kitchen gardens
		Window boxes
		Balconies
		Barrels

## Chapter 3 : The Productive Landscape in Persian Gardens ; Foundations and Characteristics<sup>2</sup>

The purpose of this chapter is to explore the dimensions and attributes of the productive and agricultural landscape in the Persian gardens. The methodology of conducting this chapter is descriptive-analytical. The data is gathered through library research and interviews, as well as field studies in the six Persian gardens (*Akbariyeh*, *Rahim Abad*, *Amir Abad*, *Bahlgerd*, *Pahlavanpur*, and *Shahzadeh*).

Nowadays, the socio-economic benefits of edible landscaping motivate the landscape architects to integrate the urban agricultural phenomena into the development of landscape and open spaces, considering the productive dimensions of the landscape has increased. Also, designers are being encouraged to get the ideas of the historical gardens (Gorgolewski, Komisar & Nasr, 2011). The terms “Agrileisure” (Farmer, Chancellor & Robinson, 2014; Amsden & McEntee, 2011) and “Agrotourism” show the recreational functions of the edible landscape (Barbieri and Valdivia, 2010; Yang, Cai & Sliuzas, 2010) and can be studied in Persian gardens.

On the other side, contrary to the formation of Iran’s historical gardens under the religious, recreational, and political reasons, and the differences between the “*char-bagh*”s plan (Heidarnataj & Mansouri, 2008), utilitarian agriculture and pleasure gardening are the most common and public reasons for designing and building the different Persian gardens (Motedayyen, 2009). But the productivity attributes of the gardens has less been considered by the researchers. Therefore, this study aims to answer the question what qualities does the agricultural landscape have which the large spaces of the gardens has been allocated to the productive scenery. In parallel, the recognition of contexts, the causes of the formation and the impact of these factors on the specific characteristics of the agricultural landscape is another objective of this chapter.

The methodology of this chapter is analytical, and the data has been gathered in library studies, interviews, as well as field studies in six Persian garden. The field studies were conducted in September 2014 including interviews with managers, consultants, and also old gardeners which helped to complete the field studies. *Akbariyeh* and *Rahim Abad* gardens were the governmental

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<sup>2</sup> This chapter as an article has been published in peer-reviewed scientific *Journal of Bagh-e-Nazar*, 2016; 13 (38): 3-16.

gardens in *Qajar* and *Pahlavi* eras in *Birjand* territory (the capital of Southern Khorasan Province). The *Bahlgerd* and *Amir Abad* Gardens (*Qajar* gardens) have been constructed outside the *Birjand* and were connected to the rural context (Ranjbar, Mehrabani Golzar & Fatemi, 2005). *Pahlavanpur* as a residential-productive garden is a *Qajar* garden which was constructed in the *Mehriz* territory (not far from Yazd), a city in the center of Iran (Yazd Cultural Heritage Office, 2013). *Shahzadeh* garden as part of the other case study is located in the *Mahan* desert area and has marvelous terrace gardening on a sloping bed with residential and ceremonial functions (Abardasht Consultant Engineers, 2003). In addition to the registration all of those gardens in the list of Iran's National Cultural Heritage, *Akbariyeh*, *Pahlavanpur* and *Shahzadeh* gardens have also been recorded in UNESCO World Heritage (consequent figure).

## History of research

The earliest bibliographic references in the garden and landscape sciences in Islamic civilization are manuals of agriculture and botany as *al-Filahat al-nabatiyya*, written in 904 C.E. by *Ibn Wahshiyya*, and Calendar of Cordoba (*Kitab al-anwa'*) of *Ibn Masawayeh*. Also, we can mention *Kitab al-filaha*, a book of agriculture, of *Ibn Bassal* which is about the calendar of agricultural, horticultural species and farming practices. In Iran, *Yavaqit al-'ulum* (1117), *Fakr al-Din al-Razi's Jami al-'ulum* (1179-80), and *Sham al-Din Amuli's Nafayis al-funun* (1340) are the oldest treatises on beekeeping, gardening and tree planting (Ruggles, 2008). *Qasim b. Yusuf Abu Nasr Heravi's Irshad al-zira'a* (Guide to Agriculture) in 1515 is the most important book on gardening and the planting design of fruit and ornamental species in the gardens of the Timurid period. The other traditional book in the science of gardening is *Ma'rifat-I filahāt* (Twelve Chapters on Agriculture) written by *Abd al-'Ali Birjandi* (deceased in 1527) which includes knowledge of agriculture, farming and trees, knowledge on different types of trees and their specifications, as well as the science of fruit harvesting and holding. *Kashan history* written by *Abdulrahim Zarrabi* (1956) has very detailed descriptions of agricultural practices and products that were being raised in the city of Kashan in the nineteenth century.

Wilber (1962) also points out some of the most important fruitful plant species in Persian Gardens. Pirnia (1994) in addition to introducing the names of plant species, mentioned their position in the garden planting design as well as their use. Shahcheraghi (2013) without particular

emphasis on the productive landscape, believes that the multiple systems in Persian garden including landscape system, shadow system, sound system, smell system, and taste system are the outcomes of the system of planting design, from a physical and functional perspective.

In the recent period, coinciding with the decline in the status of farming significance and peasant culture in socio-economic systems and due to the changes in the culture of contemporary architecture, the productive landscape has not been considered and many studies lack the landscape approach.

### **Productive landscape in Persian garden**

Studies of plants and trees in the Persian gardens show that the plant species can be categorized into two fruitful and ornamental categories. Each of those classes makes an exceptional greenery which is distinguishable according to differences in species, plant location, plant design, and operation. Therefore, the Persian Garden's inner landscape has two kinds of green scenery: productive (edible) landscape and ornamental (non-edible) landscape. Interestingly, that characteristic is not limited only to being present in the orchard and agricultural gardens; rather the formal gardens also have fruit trees and other plant species containing food products (Shahcheraghi, 2013). Fruit trees in the plots as the edible greenery occupy a large proportion of the garden and in combination with ornamental trees (the main axis of the garden), forms the plant structure of the garden.

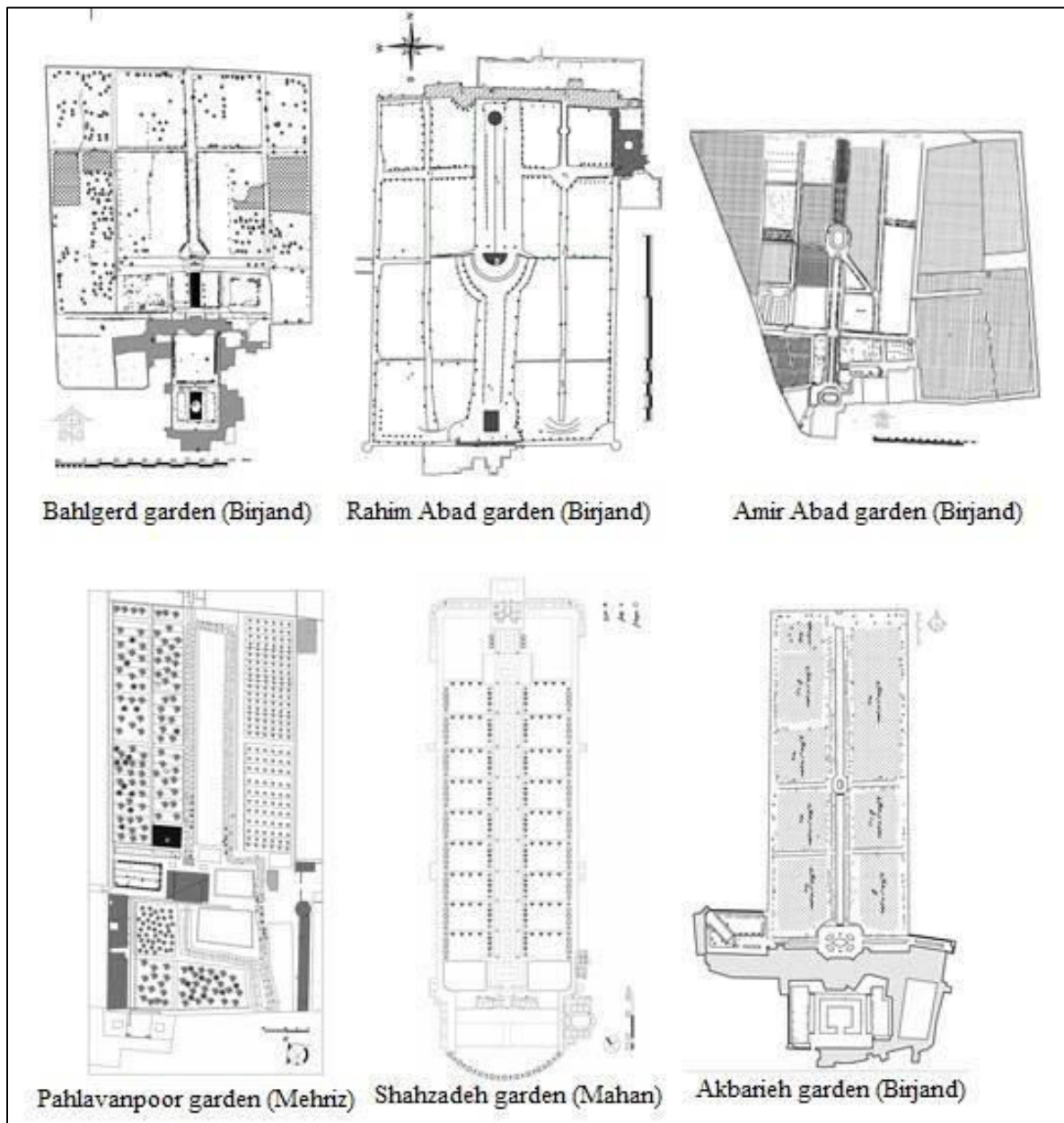


Figure 14. Plans of the case studies

## **The contexts of formation the productive landscape in Persian gardens**

### **Cultural-religious context**

In the ethical books and treatises as advice to the governors, and to a lesser extent in the works of philosophers, frequent references are seen to the issue of the status of agriculture in the Theory of Government. *Avesta* (the sacred writings of *Zoroastrianism*) explicitly praised a nonnomadic life of farmers and confirmed restoration of moorland. Similarly, the Islamic philosophers considered the agriculture as the fundamental activity of establishment the order and the job for survival the humankind. Concerning farming and ethical treatises, the Board of Governors has been recommended to accumulate treasures and meet their property requirements by developing the agriculture (Lambton, 1977: 166). In the culture of the ancient Iran, plantation and agricultural practices were sacred, and planting the wheat, fodder, and fruit trees have been emphasized in parts of the *Avesta* (Pirnia, 1994). Islam focused on the prohibition of cutting the fruitful trees, encouraging the agricultural jobs as the prophets' jobs, and introduced the palm tree as a sign of wealth. Daneshdust (1990) believes one of the famous charters of the *Tabas* (a desert city in the East of Iran, in South Khorasan Province) religiously dedicated letters is insisting the benefactors on the priority of preserving and developing the farms, gardens and trees over other things. Therefore, the productive landscape reflects the influence of IslamicIranian context in Persian gardens by considering agriculture, horticulture, and land reclamation.

### **Geographic- environmental context**

Persian gardens were formed in areas with the specific characteristics of the geographic bed which helps boost the agriculture and horticulture. *Shazadeh* Garden deployed in such a way that the use of *Tigran* aqueduct water is possible (Abardasht Consulting Engineers, 2003). *Pahlavanpur* garden is located in sloping plain, surrounded by *Shirkooh* Mountains, in the context of the gardens, which is irrigated by the three aqueducts (Yazd Cultural Heritage Office, 2013). This cold climate is beneficial for growing almond, apples, persimmon, and pomegranate trees (Shiravand, 2010) that are the main products of that garden. Based on the necessity of ecological and structural connectivity of garden and its environmental context, the gardens of Birjand (as the arid ecology

under the environmental tensions) have been located in the context of agricultural lands (*Bahlgerd* and *Amir Abad* Gardens) and connected to the rural structure (*Akbaryeh* and *Rahim Abad* Gardens). In fact, a series of natural factors prepare the land fertility and enable garden productivity in the presence of water (Jayhani & Emrani, 2007).

## **Socio-economic context**

Ruggles (2008) believes that there was no any evidence of planting the species merely for decorating purposes in the formal and informal gardens in the Islamic civilizations. Rather plants had to fulfill the productive dimensions that the edibles could be offered the relatives of the garden owners or returned to the gardeners as their wage. Considering the fact that one of the fundamental reasons for developing the gardens was the economic policies and the use of the products (Heidarnattaj & Mansouri, 2009), the gardens were be looked as resources for building the self-sufficient society (Naghizadeh, 2013). Accordingly, the concept of economic usefulness makes the fruits imperative (Motedayen, 2009). Also, the remoteness of some cities, such as Tabas of the fertile cities, encouraged the local people to produce fruits and vegetables in their urban and peri-urban gardens (Daneshdust, 1990). One example of the economic perspective on the landscape is planting the saffron in Birjand's garden. Despite the weak demand for water (as a scarce resource in Birjand) saffron has doubled the economic performance in comparison to the other agricultural products and makes the invaluable income for the owners and gardeners (Barabadi et al., 2010). Therefore, the reliance of traditional communities to their local agricultural products and the wise attitudes into the economic utilization of water, land and labor, have provided the socio-economic context of planning and designing the fruitful greenery in historic gardens.

## **Characteristics of productive landscape in Persian Garden**

### **The landscape of outdoor recreation**

As one of the capacities of today's farms, orchards, and agricultural landscapes is the possibility of integrating them into the other applications (Han & Pieschel, 2009), and their outdoor recreational services for property owners, neighbors and public include fruit and seed collecting, hunting, wildlife viewing, hiking and meditation in nature (Barbieri and Valdivia, 2010), it can be



guessed that the agricultural greenery was not considered as the single land use in the Persian gardens. Hence, the gardens of the *Safavid* period bares the combination of public and private purposes (Shahcheraghi, 2013) leading people to visit and use the *Hezarjarib* garden in Isfahan, while it has been full of fruit trees (Zangheri, Lorenzi & Rahmati, 2006).

It is also intended to foster the creation of gardens of medicinal and healing plants for treatment the patients, while its public usefulness as a promenade has been considered (Motedayyen, 2009). Kabir Saber (2008) points out that the *Fath Abad* garden in Tabriz has two gardens: an inner garden and a fruit garden, and interestingly, the inner garden also has fruit trees in addition to its private outdoor recreational services.

Another example is the ceremonial gardens of Birjand city. As a matter of fact, Birjand city was being regarded as the gate between the East and India in the 17<sup>th</sup> century. The politician traffic was increased, and England and Russia established their consulate office in Birjand. Therefore, the local authorities of Birjand provided the appropriate space for meetings and sociopolitical traffics and designed and constructed the gardens as the natural and social condition in different eras (Saberifar, Karampour & Halajmoghadam, 2015). Thus, one of the functions of those ceremonial and formal gardens was provisioned the recreational facilities for the officials and authorities (Safaei, 2014). So even the political aspects of gardening and horticulture ensured the provision of productive landscape as a recreational facility which could promote the qualities of the garden.

### **Flexibility in composition**

Persian gardens as agroecosystems comprise the variety of trees, shrubs, and aromatic herbs to achieve multiple benefits. So that, except the main axis and the borders of plots where the shading trees are planted, fruit plots by their repetition and juxtaposition form the central garden space (Pourmand & Keshtkar Ghalati, 2011; Jayhani & Emrani, 2007). As the garden was bigger, the larger parts dedicated to the fruit trees that planted in neat rows at intervals (Wilber, 1979). The field surveys of this study demonstrate that the fruitful species, under the abovementioned plant system, can be categorized into four spatial statuses consisting of points, lines, surfaces, and volume, which show the flexibility of edible plant species in spatial composition and the composition with elements of the garden plot and ornamental plants.

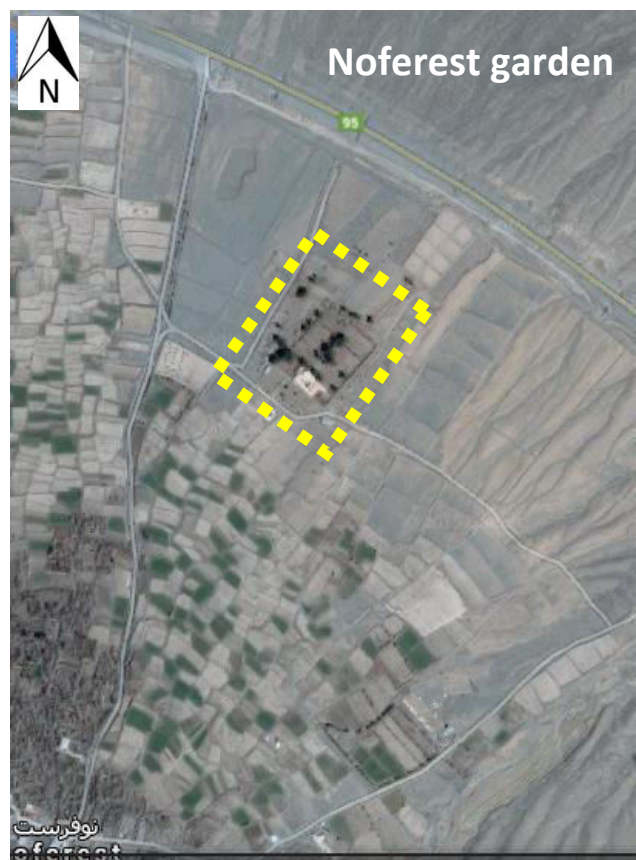


Figure 15. Ecological and structural relationship of the historical gardens with the agricultural and rural context in Southern Khorasan Province in Iran. Source: Google Earth

## **Edible and nutritional aspects**

In Persian gardens with the exception of shading and decorative plants, other plants have edible products (Kafi, 2014). In addition to the variety of agricultural commodities, each garden has one or two main products. Considering the promotion of the nutritional aspects of the garden products in the Pahlavanpur garden led to planting nearly 17 species of trees such as pomegranates, blueberries, figs, grapes, apples, almonds, and apricots (Yazd Cultural Heritage Office, 2013). Even the structure of Amir Abad garden indicates that apart from the top story plants (pine and cedar), the middle and lower green strata have edible yields.

In this regard, Iranian gardens can be called healing gardens or health landscape, because plants with edible fruits or herbs are one of the design principles of healing gardens (Nikbakht, 2004). This attribute was not applied only to productive gardens, even the royal gardens in Tehran during the Qajar period had fruit trees and vegetables (Soltani, 2007). The edible yields were not only for human use, because clover and alfalfa were planted as the cover plants that provided the appropriate nutrition materials for raising the livestock (Shahcheraghi, 2013). Furthermore and from the ecological biodiversity viewpoint, some food components like fruits are also used by birds and other animals. Table four shows the author's findings on the diversity of fruit and non-fruit plant species in the case studies.

## **Ecological importance**

There are fruit trees and species which attract wildlife species (birds, butterflies, insects and small animals) and provide shelter and food for them. In addition to the beauty and vitality of the gardens due to the presence of the birds (Danshdust, 1990), whereby organic pest can be ecologically controlled, and the enjoyment would be promoted by hearing the singing voices (Nikbakht, 2004). Also, it should be mentioned the visual application of the vines which grows on trellises that fed the birds whose presence would strengthen and increase the capacity of the cultivated land (Kafi, 2014; Ruggles, 2008).





Pistachio in Amir Abad garden



Fig tree in Rahim Abad garden



Quince tree in Shahzadeh garden

Vegetal Point



Pomegranate tree line in Amir Abad garden



Pistachio trees line in Bahlgerd garden



Pomegranate tree line in Rahim Abad garden

Vegetal Line



Surface edible plants in Amir Abad garden



Herbs surface in Akbariyeh garden



Surface edible plants in Rahim Abad garden

Vegetal Surface



Volume of apricot in Akbariyeh garden



Volume of pistachio in Akbariyeh garden



Volume of Pomegranate in Pahlavanpur garden

Vegetal Volume

Figure 16. Flexibility of fruitful plants in planting composition and their spatial expression as point, line, surface and volume green elements in the gardens of this study

Table 4. Comparison the diversity of productive with ornamental plant species in the garden case studies

Garden name	Fruitful plants	Ornamental plants
<b>Akbaryeh</b> Governmental- ceremonial	Pistachio, Plum, pear, apricot, berry, peach, pomegranate, rose, black fig, yellow fig, pear, barberry	Pine, boxwood, cypress, ash, a variety of ornamental flowers
<b>Amir Abad</b> Ceremonial- residential- agricultural	pistachio, apricot, pomegranate, grape, jujube, berry, walnut, almond, fig, barberry, wheat, barley, vegetables	Pine, cypress, Plane tree, ornamental flowers
<b>Bahlgird</b> Ceremonial- residential- agricultural	Pistachio, apple, pomegranate, barberry, wheat, barley, potatoes, onions, eggplants, pears, apricots, plums, rose	Pine, cypress, Plane tree, elm, Iranian grass
<b>Pahlavanpur</b> Residential- agricultural	Pomegranate, berry, fig, grape, apple, plum, peach, almond, apricot, persimmon, pear, quince, red plum, walnut, hawthorn	Plane tree, boxwood, roses
<b>Rahim Abad</b> Governmental- ceremonial	Rose, jujube, berry, fig, pomegranate, apricot, almond, walnut, plum, black pepper, grape	Cypress, pine, tulips, geranium, Junipers, ivy, shallots
<b>Shahzadeh</b> Residential- ceremonial	Apple, pear, apricot varieties, cherry tree, sour cherry, quince, plum, grapes, walnut, almond, pomegranate, alfalfa, licorice, chicory,	Cypress, plane tree, poplar, pomegranate, decorative flowers, spruce, ash, pine, pyracantha, French hawthorn, Japanese quince

Table 5. Wildlife species of Shahzadeh garden, Source: author based on Bildar Mahani, 2014

Animal classes	Animals name
<b>Birds</b>	Crow - sparrow - Nightingale - starling - parrot - dove - hawk - woodpecker – plover Migratory birds: Wagtail, sandpiper
<b>Animals</b>	Fox, Turtle, Snake, Mouse, Small hedgehog, Squirrel
<b>Insects</b>	Butterflies and a variety of beetles



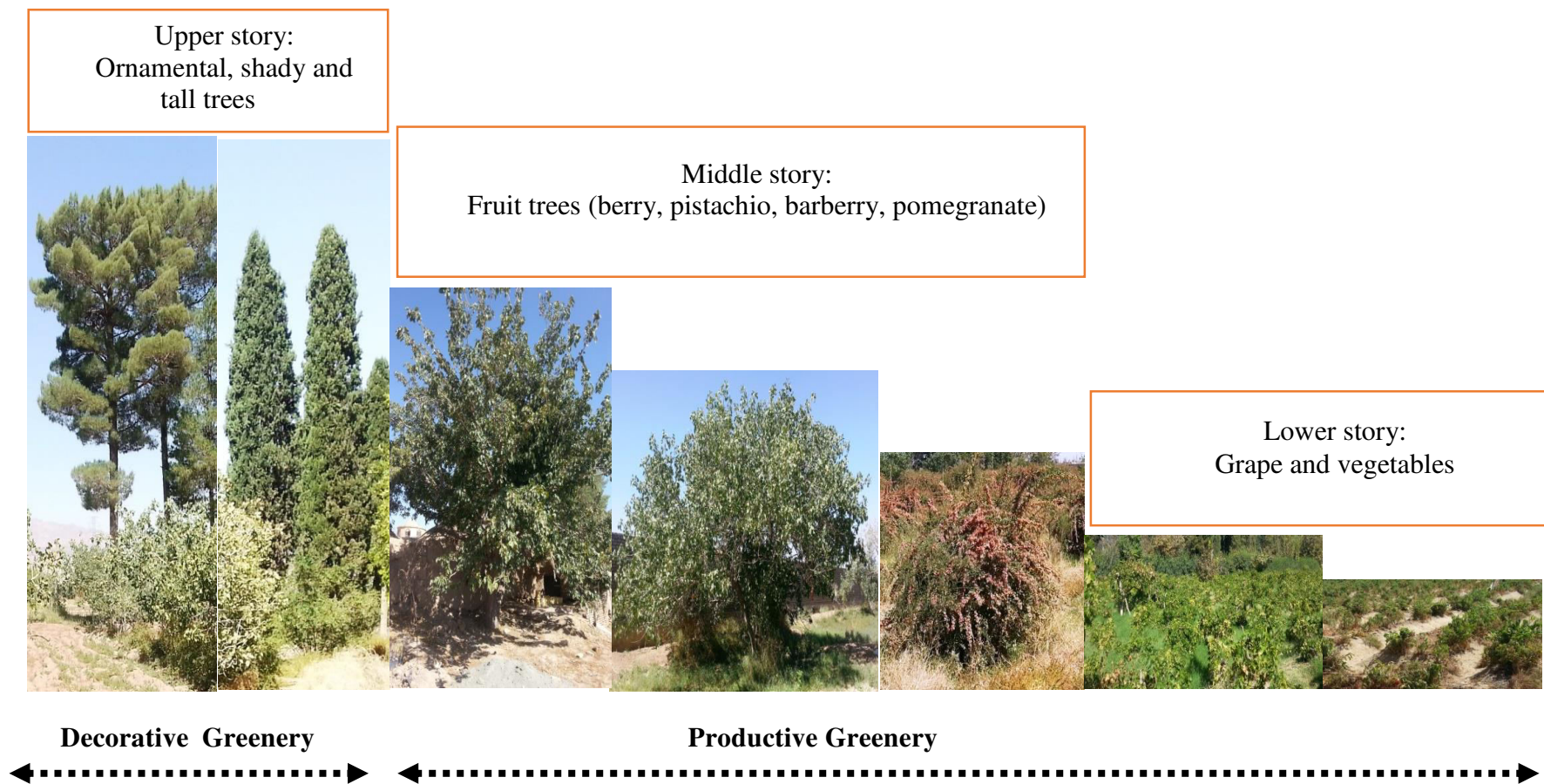


Figure 17. Elevation structure of utilitarian and pleasure greenery in Amir Abad garden (Birjand)

## Aesthetic function

Certain distinctive visual attributes of fruitful and non-fruitful species at different times of the day and also their differentiations during the seasons show the beauty of the contrast in form, color, texture, size, and scale, which enhance the garden's aesthetic content. Thus, this generates the visual contrast of deciduous and blossoms of fruit trees to the evergreen of the central axis and reveals the importance of edible species in the painting of the beautiful gardens.

As following figures illustrate, in the historical gardens of Birjand as the geographical location of the sunny region, the visual relationships of the observer and the green scenery are provided by making the ornamental plants such as pine and cypress as a darker and green vertical background. It highlights the bright colored productive species such as apricots (Rahim Abad garden), grapes, pistachios and barberry (Amir Abad and Akbariyeh garden). Therefore, in most of the viewpoints from the fruit plots' location toward the main axis, the spectator looks the united landscape which consists of productive species in the foreground and ornamental species in the background.



*Figure 18. Visual contrast of productive plants in foreground (grapes and pistachios) and decorative in background (Cypress), and its impact on improving the visual quality of scenery in Amir Abad garden*



*Figure 19. The decorative frame and background for demonstrating the productive shapes in the Rahim Abad garden (Birjand)*

### **Multi-functional plant species**

The core of "multi-purpose plantation" are the versatile plant species that beyond producing the yield can promote the biodiversity and beauty as well as enhancement the landscape quality (Oosterbaan, 2004). In the Persian gardens, the productive plants in addition to their primary function (fruit, wood or shadow) have other functions as well. Fruit trees blossom in spring which turns them into decorative species that are visible from the main garden path in the Shahzadeh garden. The berry trees are scattered in a situation in Rahim Abad garden, which in addition to fruit and visual diversity, they provide shade for the gardeners and visitors. Medicinal herbs such as rose with dense foliage operates as the mulch plant in the season of water crisis (Kafi, 2014). Another example is forage crops (alfalfa) which are the productive, fragrant, beautiful, economical and easy maintenance plant that absorbs the nitrogen into the ground, averts the flies and mosquitos, and its flowers are nutritious for bees. (Abolghasemi, 1992). Thus the intention was not only food production. Hence, but the acquisition of a range of ecosystem services (fruits, leaves, bark, wood, roots, feed, pharmaceuticals, and scenery) has also encouraged the designers to devote a large part of the garden to the productive landscape.



## Climate-oriented and optimal use of environmental resources

Iranian landscaping culture has mostly utilized the maximum output from the minimum input of the scarce resources (Kafi, 2014). *Irshad al-zira'a*'s author recommends filling the space between the rows of apricot, by peach, plum and red roses (Ruggles, 2008). The local xeriscaping principles tell that the garden space must be zoned to several areas considering the scarcity and water. One area is the palace which requires irrigation to grow vegetables and seasonal flowers to enhance the visual effects of decorative plants. But the adjacent to the central axis and garden intersection allocates to grow herbs and roses, and at last the trees with very low consumption such as pomegranate and fig tree were being planted in margins (Kafi, 2014). In fact, the garden plots were designed in accordance with the geographic direction and environmental characteristics, use of sun, wind resistance, meeting the maximum and minimum temperature, comfort maintenance and frequent harvesting (Abolghasemi, 1992). So, the reason for planting the pistachio next to the garden wall In the Bahlgerd and Amir Abad Gardens is due to its high resistance to harsh environmental conditions in addition to its low water requirement.

## Healing aspects

Herbs and flowers were being planted not only for beauty and pleasant aroma but also as part of a healthy diet and their use in perfumery (Ruggles, 2008). Author of *Irshad al-zira'a* (Guide to Agriculture) mentions the healing properties of aromatic and medicinal plants (chicory, borage, saffron, etc.), medicinal properties of many fruits (prune, cherry, apple, pear, quince, pomegranates, nectarines, peaches, walnut, jujube, olive, almond, fig, oak, palm, berry, hazelnut) and also highlights the healing benefits of non-fruit plants (plane tree, willow, jasmine, mallow, violet, narcissus, etc.).

Therefore, some fruit trees like figs have been planted in Bijand's garden for medicinal use of their latex (Safai, 2014). On the other side and considering the application of organic management (Bildar Mahani, 2014), the consumption of the fresh fruits and organic products is also the other aspect of the therapeutic property of the garden. So thinking of promoting the healing characteristics of the garden motivated the garden designer of the No garden in Tabas which is a residential garden to fill the plots with a variety of fruit trees such as orange, palm, pomegranate, plum, apricot and other fruitful trees (Daneshdust, 1990).

Thus, in addition to the beauty and fragrance of roses which were being abundantly planted in the gardens of Tabas (Daneshdust, 1990) and herbs (licorice, chicory and carnation) in the Shahzadeh garden (Bildar Mahani, 2014), the intention was to promote the aromatherapy which is significant from the perspective of traditional medicine and health aspects.

## **Discussion**

In historical gardens and contrast to the contemporary parks and green spaces, there were both utilitarian agriculture and pleasure gardening (Ruggles, 2008). Nowadays, several concepts of development the productive landscape such as multifunctional landscape projects (Sy, Baguian & Gahi, 2014; Viljoen, Bohn & Howe, 2005), multipurpose plantation (Dubbeling, 2011), participatory landscape (Bendt, Barthel & Colding, 2013; [Colding & Barthel](#), 2013) and Continues Productive Urban Landscapes (Viljoen & Bohn, 2014) are being proposed.

This study shows that many advantages of the productive landscape that are being considered by planners and landscape architects such as recreation and leisure, economic aspects and entrepreneurship, health and social welfare, beautification, restoration and environmental rehabilitation, were being regarded in planning, designing, and maintaining the Persian gardens. Therefore, in response to the question why one of the main structural parts of the Persian garden is fruitful greenery, not only in agricultural gardens but even in formal and ceremonial gardens, and not only in the single historical periods but continuously in history and also in different climates, we can mention the multidimensional characteristics and advantages of the productive scenery and its consistency to the cultural, environmental and economic contexts.

Hence, the guidelines of the agricultural landscape planting design were being determined by a climate oriented approach in addition to the importance of diversifying the products and the promotion of the aesthetic attributes of the visionary sceneries. Furthermore, the integration of utilitarian agriculture and pleasure gardening in Persian gardens, improved the quality and aesthetic content of the landscapes, revealing the versatile nature of edible plants and crops, as well as making an appropriate built environment which was resilient to meet the needs of humans and animals over the years.

Accordingly, the concept of promoting the use of environmental resources by combining horticulture and agriculture, organizes a particular kind of plant system that complies the ecological and economic needs and political considerations, and could even supply food products directly and indirectly, as well as the basis for employment and as a habitat for other creatures.

*Table 6. The characteristics of productive landscape in the gardens of this study*

<b>Characteristics</b>	<b>Definition</b>	<b>Examples</b>
<b>Landscape of outdoor recreation</b>	Supplying multiple consumable and non-consumable services to owners, guests, and people	Agricultural sceneries in governmental gardens of Birjand and Shahzadeh garden
<b>Flexibility in composition</b>	Organization the points, lines, surfaces, and volumes of productive plants in the garden	Berry and fig trees as the points, pomegranate row on the sidelines of secondary paths in Birjan's gardens, planting forage and vegetables in between the rows of fruit trees, multiple fruit trees as the volumes
<b>Edible and nutrition aspects</b>	Food production for human consumption and other animals	Various fruit trees in Amir Abad, Shahzadeh and Pahlavanpur gardens
<b>Ecological Landscape</b>	Providing safe habitat for humans and animals	Shahzadeh garden as a haven for birds, insects, and small animals
<b>Aesthetic function</b>	Promotion the quality of beauty of green visual landscape	Creation of visual composition of productive and ornamental species in the gardens of Birjand
<b>Multi-functional plant species</b>	Multi-species with the aim of increasing efficiency, profitability, and self-sufficiency	Multifunctional applications of more efficient plant species in the gardens of this study
<b>Climate-oriented and optimum landscape</b>	xeriscaping, zoning the space of the garden, selection the species in adaption to the climate to conserve the scarce resources	Planting resistant varieties of pistachio on the sidelines of the wall in Bahlgerd and Amir Abad Gardens, Saffron in Birjand's gardens, and pomegranate in Pahlavanpur garden
<b>Healing landscape</b>	considering the human five senses, organic products, aromatherapy and herbal therapy	Various varieties of fruits, medicinal, and fragrant flowers

Relying on native plant sources, considering the properties of the plants beyond the morphological aspects of them, not popularity the using of foreign ornamental plants, and the necessity of productive gardens, explains dedicating the vast plots of the Persian garden to the productive landscape. In fact, agricultural greenery was a kind of local landscaping, which beyond

production and decoration functions, was an Iranian resource for outdoor recreation, moreover supporting the local culture and traditional agriculture.

Studying the traditional books of agriculture such as *Irshad al-zira'a* (Guide to Agriculture) and *Ma'rifat-I filahāt* (Twelve Chapters on Agriculture) reveal the importance of fruit trees and crops in traditional thinking of utilizing the land and water. So that those resources have taken into consideration the principles of planting, maintaining and harvesting the vines, olives, apples, figs, pomegranates, almonds, walnuts, pistachio, peach, pear, palm, orange and so on, and at the same time mentioned their medicinal and health properties. Therefore, the agricultural landscape in Persian garden's structure is a continuation of the written culture in spatial and environmental planning and design.

This study shows that the dynamic nature of productive landscape (fruit trees, farm, and agriculture) can be an indicator to assess the quality of the current management of the historical gardens:

### **Indicator for the quality of garden management**

Because of the conservation and restoration of the fruit landscape consisting of numerous affairs including water and land management, economic management, combating water scarcity and drought, horticulture and crop management, and today, tourism and leisure management, it can be an indicator to assess the quality of garden management, as well as assessing its reliance on traditional knowledge and science and focus on new approaches to environmental restoration of the historic gardens. One of the critical elements that have been affected by the evolution in the management of gardens are crops and productive infrastructure. So that, the ornamental plants such as pine and cypress due to their greater resistance to environmental stresses and the less need for health care operations can not only be an indicator to measure the quality of management the landscape of the garden.

### **Indicator of the prestige of agricultural knowledge**

The activities of planting and harvesting fruit species require knowledge of the soil, ground, time, planting, transplant, the fruit-picking and holding and disposal of Parasite. Productive landscapes including fruit and vegetable crops and forage plants require regular care and

continuous agricultural operations based on the knowledge of planting and harvesting. Therefore, it can be an index to measure the knowledge of agriculture of their managers. Quality, vitality and sustainability of the agricultural landscape can indirectly reveal the dignity of farming, horticulture and production among owners and administrators, and organizations in charge of the garden.

### **Indicator of garden health**

According to the properties of agricultural landscape mentioned in this chapter, the fruitful green space is healthy when the multi-layered system of points, surfaces, lines and volumes exist. The presence of animals and wildlife in the garden is also a kind of vitality and health of the edible plants. Also, the adaptation of species to the climate, organic farming, multipurpose plant species (decorative-productive) can be useful an index of the health of landscape and garden. Unfortunately, in the gardens of this study and many of historical gardens, green volumes turn into lines, lines turn into points over time due to the mismanagement, climate change and adverse changes in culture, and thus the single fruit trees are the last remaining of the utilitarian gardening. The diversity of edible fruit and vegetable layers decreases, and in accordance the reduction in the variety and volume of vegetation, the productivity is minimal. So, the agricultural greenery because of its multidimensional, multilayered, and diverse identity can be an index to measure the health and vitality of the garden.

### **Indicator of lifestyle**

Historical gardens can be used as an indicator to assess the lifestyle of the time in which they are used. Protecting and restoring the productive green spaces, the economic and entrepreneurial and self-sufficient agriculture that could support a part of the community's needs, and combining recreation and produce are the signs of Iranian lifestyle that emphasizes on continuous, regular and timely agricultural works to take advantages of the environmental resources and taking the wise reactions to deal with the problems. On the other hand, the destruction of fruitful plant species, transforming the agricultural fields to decorative green space, moorlands, and dead trees are the symbol of a consumerism lifestyle that the production and use of land and water and other environmental factors are not being taken into consideration, and so is relying to the other areas for getting the nutritive materials.

## **Indicator of continuity the cultural-economic-natural contexts**

Multiple foundations of productive landscape as a major structural part of the Persian gardens indicate the importance of maintaining the garden relationship with its economic, cultural and natural contexts. Iranian's attitude to agriculture and production and the importance of urban agriculture and entrepreneurship in the agricultural and horticulture sectors can be done through the study of existing historical gardens. The attitude and behavior as the cultural context change the utilitarian agriculture.

On the other side, the real economic output of the agricultural landscape has also been significant. Changes in geographic and environmental features such as water scarcity, climate change, the changing of rural areas to urban areas, and enclosing the gardens in urban developments, represent a new geographic context for the historic gardens. Therefore, the stability, efficiency, and vitality of agricultural greenery depend on its relationship with its multiple settings. In fact, parallel to the disruption of the gardens and its context, the agricultural features will suffer from a declining trend until taking integration and continuity of its context and thus can measure the continuity of the garden and its bed.

## **Interim conclusion**

The results show that the issue of the productive landscape beyond the elements of productive crops, reveals the complexities, correlations, and dependencies in the planning and design of Persian gardens. Also, the functions of edible landscaping are not limited to agriculture and fruit production or to creating the visual green sceneries. In fact, the edible and agricultural greenery in Persian gardens is the multi-functional landscape which beyond entrepreneurship and supplying self-sufficiency, its scenery works as the outdoor recreation resources and remedial landscape, as well as its ecological attributes by taking into consideration the adaptation and sustainability of the built environment to the climate condition in order to produce the optimum outputs. Therefore, the protection of the edible landscapes in Persian gardens needs the systematic re-look to recreate the garden and its cultural-environmental contexts.

From this perspective, fruitful greenery with its multiple and varied features can be used as an index to find the invisible aspects of the quality of the current management of the historic gardens.

The quality and quantity of utilitarian agriculture and its integration into the garden landscaping provides the indicator for measuring the quality of garden management, assessment of the status of knowledge of agriculture, health assessment of the garden, lifestyle assessment, and to assess the relationship between the garden and its geographical and cultural contexts. Therefore, researchers must provide quantitative methods for each of these indicators.

On the other hand and based on the new theories that try to integrate agriculture into public green and open spaces, the advantages and features of the Iranian edible landscaping are applicable in the scale of urban agriculture planning. But in Iran, and after removal of edibles from open and green spaces, a lot of environmental quality of the landscape which could be more attractive and more efficient have been ignored. Even in Birjand city where in addition to Akbariyeh garden that is rated as a UNESCO World Heritage, has dozens of other valuable historical gardens, there is not the systemic integration of the fruitful greenery in planning and designing of green spaces and parks. Whereas, the recent studies and multidimensional characteristics of the agricultural landscape in the Persian gardens are focused on the integration of edible plants in urban landscapes.

Further studies are needed to document the Iranian principles of edible landscaping and its applicability in designing the open spaces, as well as feasibility studies for the development of “Agrotourism” and “Agrileisure” in the Persian gardens to achieve the appropriate pattern of conservation based on the socio-economic situation of Iran. One of these contexts is entrepreneurship through effective conservation and restoration of agricultural greenery of the historic gardens, as well as recreating the fruitful landscape in open spaces under the pattern of the resistant economy.





## Chapter 4 : A Survey on the Different Accessibility to the Edible and Inedible Landscapes in Persian Gardens<sup>3</sup>

This chapter discusses the different dimensions between the visitor's connection to the edible and inedible landscapes in these gardens: *Akbariye, Amir Abad, Bahlgerd, Rahim Abad, Shahzadeh, Pahlavanpour, Dolat Abad* and *Fin*, which are all located in Iran. These gardens have been studied and compared based on the visual-spatial continuity and physical accessibility from a visitor's viewpoint in relation to the green appearance of the landscape.

Historically speaking, the origins of Persian garden design is based on the excavated evidence from *Pasargadae*, the capital of *Cyrus the Great* (559-530 BC), the founder of the *Achaemenid* Empire, nearly two thousand five hundred years ago (Stronach, 1994). Regardless of the practical aspects and sensory experiences, since the *Achaemenid* Empire, the garden art also incorporated political, philosophical and religious symbolism (Khosravi, 2014). The idea of the kings was to create a fertile garden out of the unprofitable land, bringing symmetry out of chaos to constitute a powerful statement of authority, fertility, and legitimacy (Stronach 1990).

Contrary to the European gardens which are meant to be part of their surroundings, the Persian gardens, contrasts its landscape (Khansari, Moghtader & Yavari, 2004). Whereas the principle feature of Baroque gardens was the integration with the surrounding landscape, and despite the Neoclassical and Romantic gardens which bring the view of the countryside into the gardens (Turner, 2005), the visual experience of Persian gardens is bounded by enclosing walls and buildings (Wescoat, 1986). Persian gardens frame the views under the spatial-visual system created by the planting order as well as the role of hardscape elements (Kalantari, 2011).

Plants are the main elements in the gardens (Irani Behbahani, Shokouhi Dehkordi & Soltani, 2013) and thus have the principle function in interior landscaping. Beyond this, the garden designers have not merely concentrated on the decorative gardening, but specifically changed most surfaces of the garden into productive gardening (Daneshdust, 1990). This is a socioeconomical sign of the significance of agricultural landscapes which could provide fruits, foods, cereals,

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<sup>3</sup> This chapter has been published in the proceedings of 52<sup>nd</sup> *World Congress of the International Federation of Landscape Architects* which was held in Saint-Petersburg, Russia in 2015.

vegetables, livestock forage, medicinal materials, as well as a possible field for entrepreneurship and community self-sufficiency (Naghizadeh, 2013; Motedayen, 2010; Kafi, 2014; Wilber, 1979; Ruggles, 2008). As consequent figures illustrate, the interior visual landscape of the typical Islamic garden has been designated in two essential spaces. On the one side gardening for pleasure and the other hand utilitarian agriculture (Ruggles, 2008).

Structurally speaking, this study addresses the close correlation of plant order, visual geometry, and accessibility of the greenery in Iran's historic gardens. The principal objective is finding the different aspects of the spectators' relationships with the decorative and utilitarian agriculture sceneries from various viewpoints of the interior positions in the gardens. Furthermore, comparing various gardens and discovering the effects of contemporary plant conversions on the visual system is the other principal aim.

On the other hand, in the current movement to integrate the agricultural phenomena into urban landscapes (Gorgolewski, Komisar & Nasr, 2011; Viljoen & Bohn, 2014), discovering the accessibility of visitors to agricultural sceneries in historical gardens would provide a documented analysis for utilizing these executed experiences in future designs and researches. Some landscape designers seek the integration of fruitful plants into urban landscapes, but they do not know how much accessibility and connection should be provided for the public visitors. The author believes the historical gardens can demonstrate an Iranian solution for that question, which is the goal of this paper.

The questions of this chapter are the following:

- Is the spectators' connection to the edible landscape different than to the recreational scenery in Persian gardens?
- Which patterns of spectator-scenery relationship can be derived based on the comparison between the several gardens?
- Can the diverse accessibility patterns in different Persian gardens be utilized as the concepts for designers who try to integrate edible plants into open spaces?



Figure 20. Categorizing the interior green scenery of the Persian garden into two kinds of gardening, decorative (above) and productive (below), based on differentiation in plant species, planting position and design, and application. Dolat Abad (a, b) and Amir Abad (c, d) historical garden in Yazd and Birjand, respectively, Iran

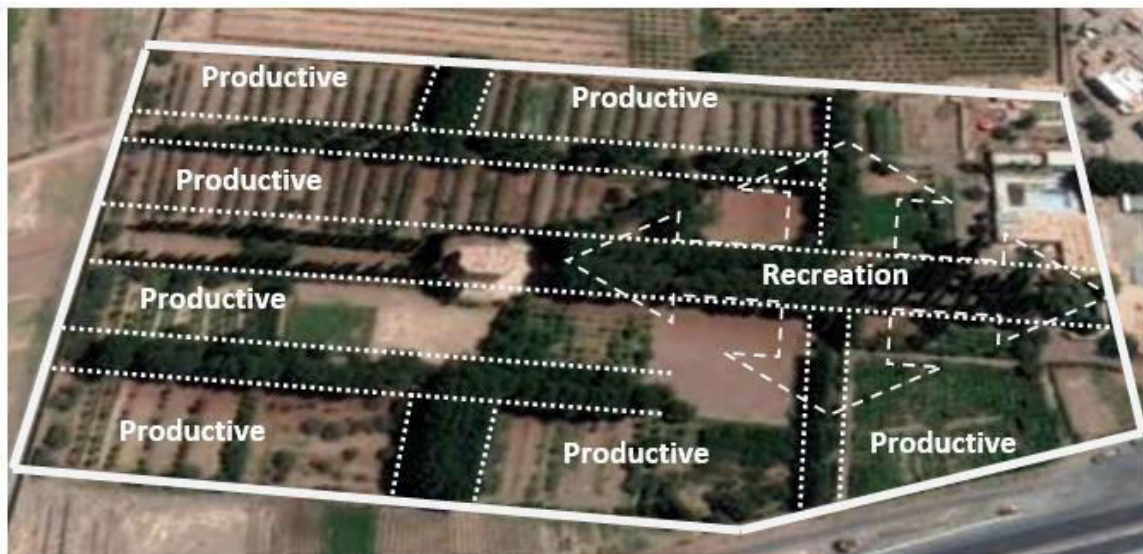


Figure 21. Separation the productive and recreation zones in Amir Abad historical-educational peri-urban garden as a tool for multifunctional space planning as well as controlling the accessibility to the yields

The methodology of this chapter is descriptive-analytical, and in addition to gathering information during a literature review and interviews, field surveys have been fulfilled on the eight historical gardens in different provinces in Iran. The field studies were done to demonstrate the quality of the visual scenery, in two main designs, decorative and agricultural, as seen from various viewpoints. So, the quality of connection for each standpoint was categorized to one of these expressions:

- ***Visual-spatial continuity and physical accessibility***

In these situations, beyond the visual- spatial continuity between the viewer and the landscape, the convenient physical accessibility to the greenery is emphasized.

- ***Visual continuity and spatial discontinuity***

In these viewing positions, the visual continuity of the scenery has been partly provided, but they have been spatially interrupted. So, the spectator needs to pass an intermediate space to reach the greenery.

- ***Visual-spatial discontinuity***

In these situations, in addition to the spatial separation between the viewpoint and the visual landscape, the viewer has no visual relationship with the green landscape in the garden.

Also, for comparing the results, in all cases, the selection of viewpoints has been determined based on the paths and pavilion. The path's positions consist of the main walkway, secondary paths, and marginal paths (the path around the garden). The viewing options from the pavilion could be categorized in two positions: front of the pavilion and the second-story terraces (in Persian: "*Nazargah*").

## **The case studies**

In this study different historical gardens have been selected by considering the importance of the plant order and its current massiveness as well as the original function for the determination of the relationship between the viewer and the scenery. These gardens are: Fin (Kashan), Dolat Abad (Yazd), Pahlavanpour (Mehriz), Shahzadeh (Mahan), Akbarieh (Birjand), Rahim Abad (Birjand),



Amir Abad (Birjand), and Bahlgerd (Birjand), which, except for the three latter ones, five of them have been registered as World Heritage Site (NBPGO, 2011).

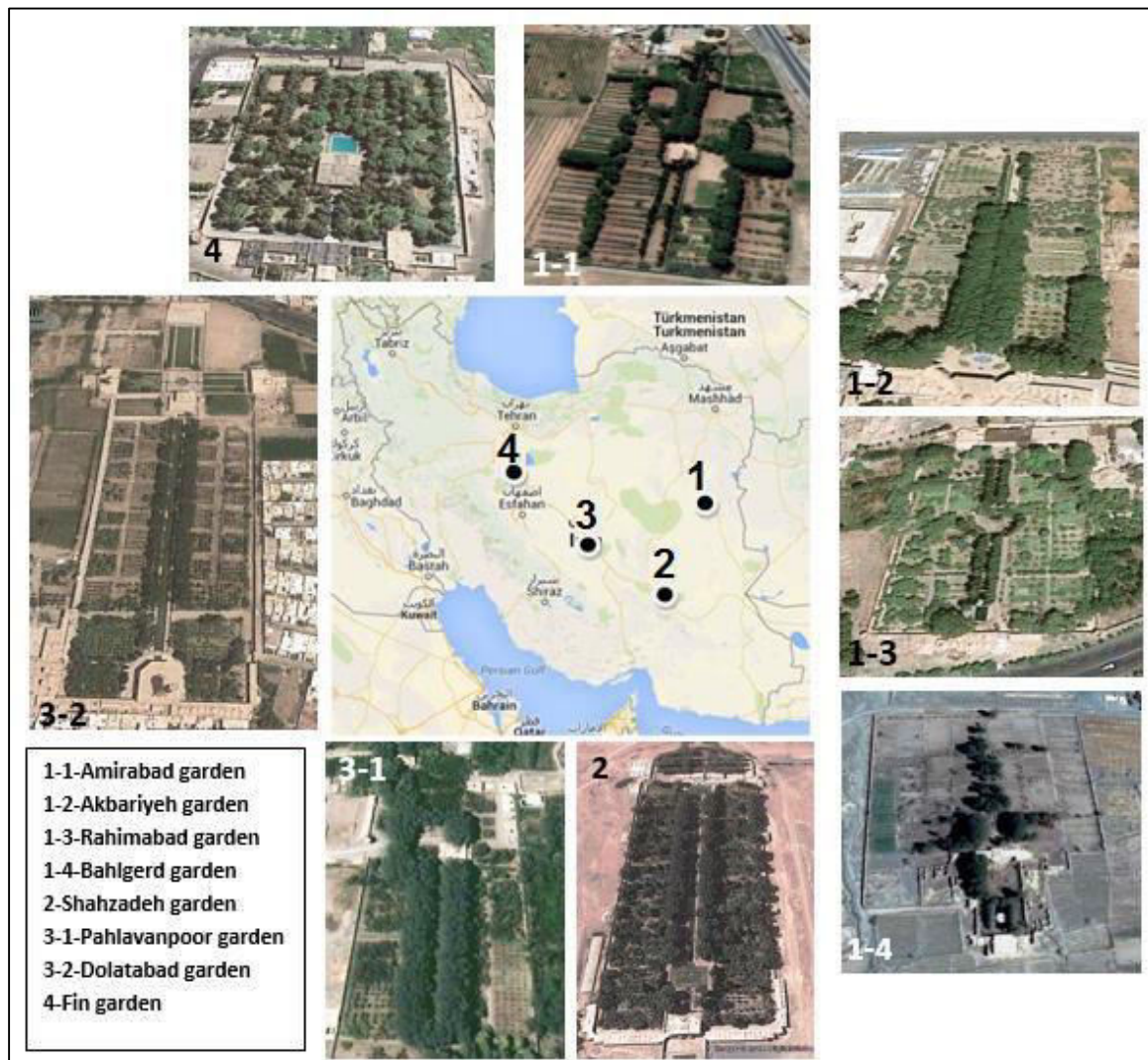


Figure 22. General overview to case studies' spatial structure and their location in Iran

## Utilitarian agriculture and pleasure gardening

Some investigators such as Ruggles (2008) emphasized agriculture and irrigation as two influential features behind the creation of Islamic gardens and landscapes. Also in a Persian cultural context, the word *Bagh* (literally meaning garden) refers both to pleasure gardens and agricultural fields. In most cases, gardens can have dual or multiple functions while a distinction between agricultural and fruit gardens and those that are solely devoted to delight should be made

(Gharipour, 2013). So that, property owners and the cultivators of the land have an interest in increasing the yield of the crops, in addition to an appreciation for the beauty of nature (Ruggles, 2008). ‘The bigger the garden, the more fruit trees are planted’ (Daneshdust, 1990: 46).

Accordingly, providing fruit and vegetables for domestic use or sale, beside the primary function of the Persian gardens as places for recreation, leisure, and enjoyment, adopted their form and function which was based on the climate and needs for the owner (Gharipour, 2013).

As the following table and figure show, this dual role makes two kinds of greenery, pleasure landscapes and utilitarian agriculture which are differentiated in plant species, positions, planting massiveness and design and eventually they are distinct in disciplines of accessibility for the public and visitors. In addition, the productivity attributes of the fruit trees as the most favorite plant elements in Persian gardens, have a critical significance in diversifying the illustrative picture of the garden, based on their characteristics in texture, size, color, density, spatial organization, which are different to the decorative plants.

## **Spectator-scenery relationship in Persian garden**

Inside the environment of the Persian gardens, the accessibility to the greenery as well as connectedness to the sceneries is provided via the paths and pavilion.

### **Paths and walkways**

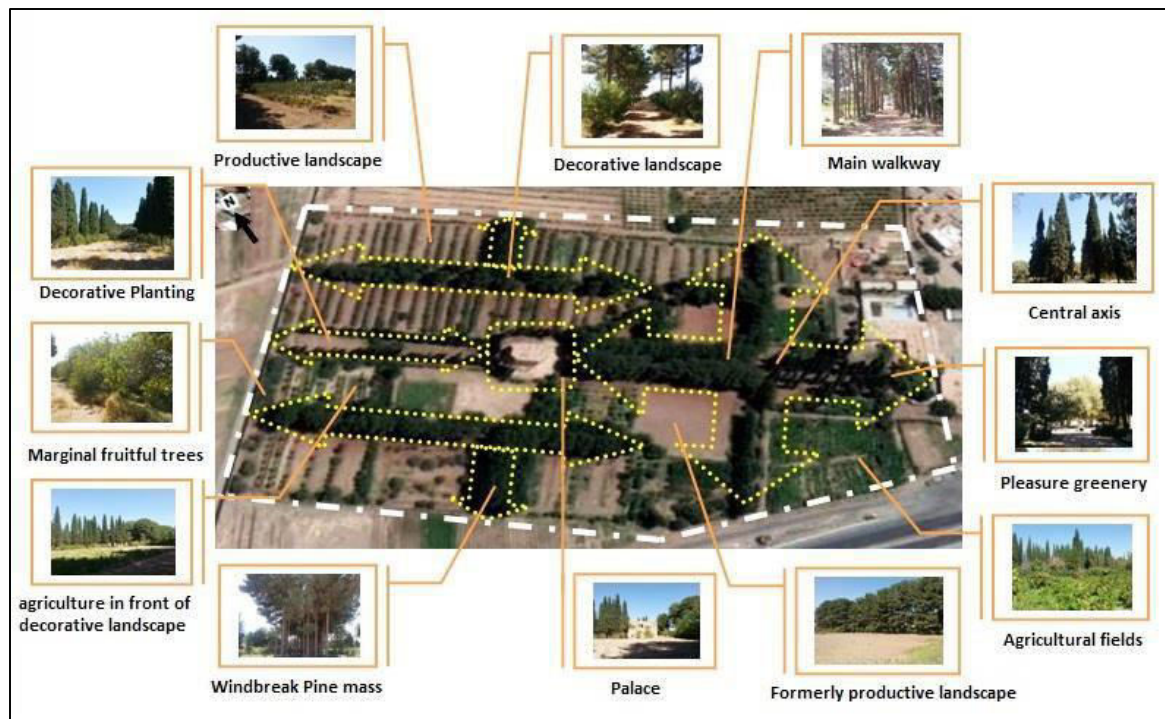
*Chaharbāgh* (four-garden) with the primary grid concept of Persian garden layouts is described as a rectangular walled platform, divided or quartered by intersecting pathways or waterways into symmetrical sections (Khansari et al., 2004; Khosravi, 2014).

The design of the Persian garden is based on the use of straight lines in the Safavid and Zandieh gardens (Daneshdust, 1990). In accordance with the tradition of secluded garden design, the visual relationship of interior garden scenery between the mansion and the central walkway alongside the primary axes was considered as the main element in Persian garden design from the ancient era (Khansari et al., 2004). Paths, consist of primary and secondary axes, defining the circulation pattern in the space and the flow pattern defines the pattern of the garden. The liner routes reinforce the visual perception of the greenery by putting the scenery inside the borders. Persian gardens

frame the view by the vertical elements which are trees and walls. The directions and axes of movement by passing the observer through the greenery routes provide appropriate positions for connection to the landscapes. Therefore, the paths and walkways have been organized in a way to preserve the visual-spatial unity of the scene, and as a point of view are one of the best positions for investigating the relationship between spectator and the interior sceneries.

*Table 7. Plants of utilitarian agriculture and pleasure gardening in Iran's historic gardens.*

Type of scenery	Application of plants	Place of planting	Name of plants
<b>Utilitarian agriculture</b>	Medicinal plants, vegetables, cereals	Between rows of fruit trees, far from the main building	Mint, Fennel, Red Rose, Wheat, Barley, Vegetables
	Cover plants	In the middle open space in front of the palace	Alfalfa, Clover, Iranian grass
	fruit trees (sensitive to the wind)	In the corners of the garden	Figs, Berry
	Fruit trees	Separate beds in both sides of the main axis	Apricots, Olives, almonds, peaches, pomegranates, quince, apples, cherries, figs, walnuts, jujube, dates, strawberries, plums, pears, grapes
<b>Pleasure gardening</b>	Shady trees	Both edges of the main axis, garden borders, borders of the paths	Cypress, sycamore, pine, poplar, ash
	Flowers	Under the trees in primary axis, around the palace	Tulips, narcissus, lily, hibiscus, roses, poppies, lavender
	Hydrophilic trees	Near the presence of water	Willow trees
	Unfruitful trees	Beside the garden's wall	Poplar, Ash, jujube, wild olives



*Figure 23. Analysis of the aerial photo of Amir-Abad garden clarifies the quality of synthesis of the utilitarian agriculture with pleasure gardening. It creates two kinds of sceneries concerning their separation in plants, position, direction, planting design, and application.*

## **Pavilion and mansion**

Persian garden design has always been featured with palaces, pavilions and Ivan which is called “*Nazargah*” (Teimouri Gordeh and Heidarnattaj, 2014). Based on the significance of visual relationship of the mansion with the open spaces, the pavilions were located on the main axis at the intersection of the *Chaharbāgh*, from center to the end of the garden (Fadaie and Mofidi Shemirani, 2014). Furthermore, ‘the design of pavilion has always been a mixture of open spaces with several balconies at different directions to permit the use of the open space’ (Teimouri Gordeh and Heidarnattaj, 2014: 65). Therefore, this kind of design (positioning and extroverted design) provides the pleasure and panoramic views from the second-story terrace and therefore, considering its visual dominance on the primary axis, the pavilion has been a symbol of sovereignty on the environment (Ruggles, 2008).

Examining the pavilions of the case studies in this survey, despite the pavilion of Fin garden which has been located in the center of the garden, in Dolat Abad it has been positioned at the end of the central axis. On the other hand, placing the main building in Akbarieh and Bahlgerd gardens



at the south façade, in spite of the Rahim Abad's which is located at the north edge of the garden perimeter and the Amir Abad pavilion which defines the center of the garden.

Based on the explanations of this section, as the subsequent figures illustrates there are five principal positions for assessing the spectator-scenery relationship in Persian gardens which are:

- 1- The Primary axes;
- 2- The secondary axes;
- 3- The marginal paths;
- 4- Front of the pavilion; and
- 5- *Nazargah* (view toward the greenery through second-story terrace).



*Figure 24. Aerial photo of Rahim Abad urban historical garden shows two main tree malls which structure the central axes and separate the non-agricultural open spaces from the fruit trees' plots which cover most of the garden land*

*Figure 25. Five principal positions for assessing the spectator-scenery relationship in Fin (a) and Dolat Abad (b) World Heritage Gardens (1- primary axes, 2- secondary axes, 3- marginal paths, 4- front of the pavilion, 5- view toward the greenery through second-story terrace of the pavilion)*



1



1



3

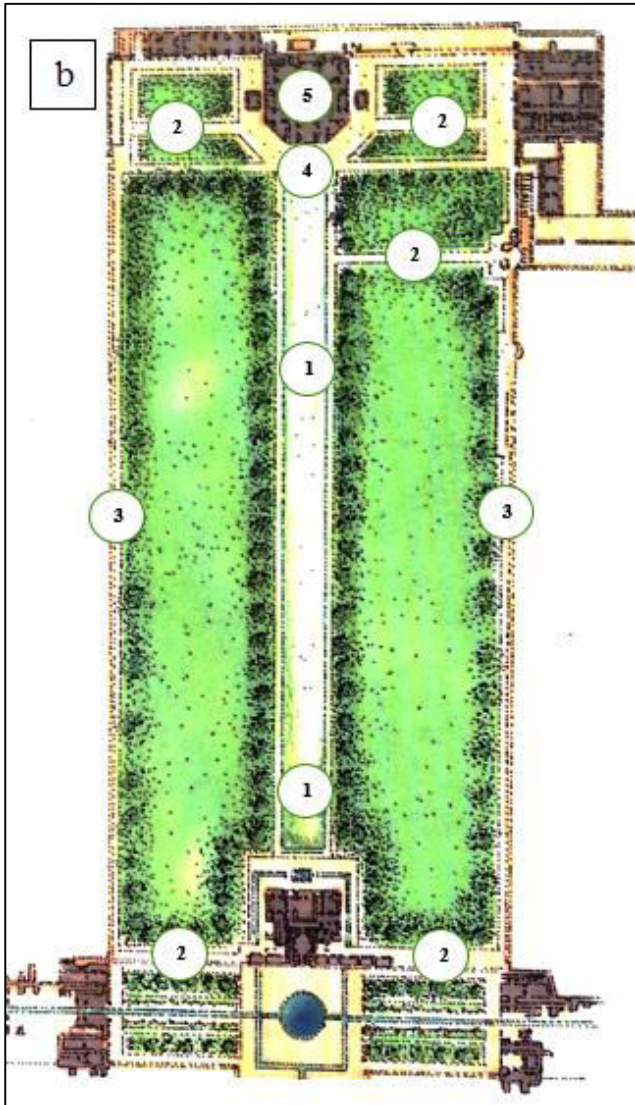


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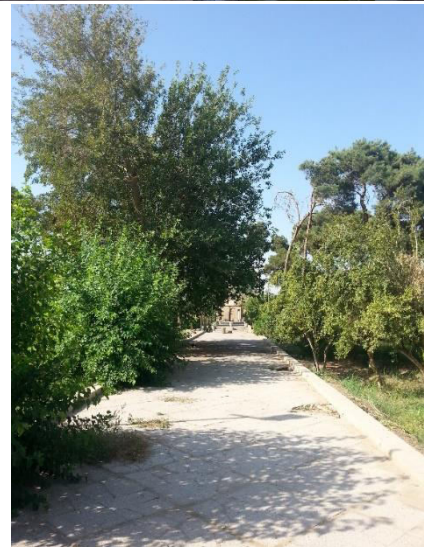




**1**



**2**



**3**



**5**



**4**



## Results

In the field survey of each of the gardens mentioned above and according to the assessment the quality of the connection between the spectators with the sceneries from the different viewpoints, several tables were filled in. These tables are organized in two categories for each of the standpoints, edible and inedible greenery. The subsequent tables present the results of assessment the spectator connectedness and accessibility from the primary, secondary, and marginal walkways' viewpoints to the edible and inedible green spaces. Afterward there are two following tables which show the results of the qualitative surveys on the visual-physical connection between the visitors from the front of the pavilion standpoint and *Nazargah* to the agricultural and pleasure sceneries. The last table demonstrates the aggregated results of the surveys to provide the comparison between the several outlooks.

Table 8. Accessibility the productive plants from the paths' standpoints

GARDEN NAME	STANDPOINT	SPECTATOR- AGRICULTURE SCENERY RELATIONSHIP		
		Visual-spatial-continuity, physical accessibility	Visual continuity Spatial discontinuity	Visual-spatial discontinuity
AKBARIYEH	Central axis			✓
	Secondary axis	✓		
	Marginal paths	✓		
RAHIM ABAD	Central axis		✓	
	Secondary axis	✓		
	Marginal paths	✓		
AMIR ABAD	Central axis		✓	
	Secondary axis	✓		
	Marginal paths	✓		
BAHLGERD	Central axis	✓		
	Secondary axis	✓		
	Marginal paths	✓		
FIN	Central axis	✓		
	Secondary axis	✓		
	Marginal paths	✓		
DOLAT ABAD	Central axis		✓	
	Secondary axis	✓		
	Marginal paths	✓		
PAHLAVANPOUR	Central axis		✓	
	Secondary axis	✓		
	Marginal paths	✓		
SHAHZADEH	Central axis			✓
	Secondary axis		✓	
	Marginal paths	✓		

Table 9. Quality of connectedness the spectator- pleasure scenery from the axes viewpoints

GARDEN NAME	STANDPOINT	QUALITY OF RELATIONSHIP WITH THE PLEASURE SCENERY		
		Visual-spatial-continuity, physical accessibility	Visual continuity Spatial discontinuity	Visual-spatial discontinuity
AKBARIEH	Central axis	✓		
	Secondary axis	✓		
	Marginal paths		✓	
RAHIM ABAD	Central axis	✓		
	Secondary axis	✓		
	Marginal paths		✓	
AMIR ABAD	Central axis	✓		
	Secondary axis	✓		
	Marginal paths		✓	
BAHLGERD	Central axis	✓		
	Secondary axis	✓		
	Marginal paths	✓		
FIN	Central axis	✓		
	Secondary axis	✓		
	Marginal paths	✓		
DOLAT ABAD	Central axis	✓		
	Secondary axis		✓	
	Marginal paths		✓	
PAHLAVANPOUR	Central axis	✓		
	Secondary axis		✓	
	Marginal paths		✓	
SHAHZADEH	Central axis	✓		
	Secondary axis	✓		
	Marginal paths	✓		

Table 10. Accessibility the edible landscape from the pavilion's standpoint

GARDEN NAME	STANDPOINT	SPECTATOR- AGRICULTURE SCENERY RELATIONSHIP		
		Visual-spatial- continuity, physical accessibility	Visual continuity  Spatial discontinuity	Visual-spatial discontinuity
AKBARIEH	Forefront of pavilion			✓
	<i>Nazargah</i>		✓	
RAHIM ABAD	Forefront of pavilion			✓
	<i>Nazargah</i>			✓
AMIR ABAD	Forefront of pavilion			✓
	<i>Nazargah</i>		✓	
BAHLGERD	Forefront of pavilion		✓	
	<i>Nazargah</i>		✓	
FIN	Forefront of pavilion	✓		
	<i>Nazargah</i>		✓	
DOLAT ABAD	Forefront of pavilion	✓		
	<i>Nazargah</i>		✓	
PAHLAVANPOUR	Forefront of pavilion	✓		
	<i>Nazargah</i>		✓	
SHAHZADEH	Forefront of pavilion			✓
	<i>Nazargah</i>		✓	

Table 11. Quality of connectedness the spectator- pleasure scenery from the pavilion

GARDEN NAME	STANDPOINT	VIEWER- PLEASURE LANDSCAPE RELATIONSHIP		
		Visual-spatial continuity, physical accessibility	Visual continuity Spatial discontinuity	Visual-spatial discontinuity
AKBARIEH	Forefront of pavilion	✓		
	<i>Nazargah</i>		✓	
RAHIM ABAD	Forefront of pavilion	✓		
	<i>Nazargah</i>		✓	
AMIR ABAD	Forefront of pavilion	✓		
	<i>Nazargah</i>		✓	
BAHLGERD	Forefront of pavilion		✓	
	<i>Nazargah</i>		✓	
FIN	Forefront of pavilion	✓		
	<i>Nazargah</i>		✓	
DOLAT ABAD	Forefront of pavilion	✓		
	<i>Nazargah</i>		✓	
PAHLAVANPOUR	Forefront of pavilion	✓		
	<i>Nazargah</i>		✓	
SHAHZADEH	Forefront of pavilion	✓		
	<i>Nazargah</i>		✓	



*Table 12. Aggregated results of spectator-scenery connectedness from various standpoints in case studies*

STANDPOINT	LANDSCAPE TYPE	AGGREGATED NUMBERS OF SPECTATOR-SCENERY RELATIONSHIP FOR EACH OF THREE CATEGORIES IN EIGHT GARDENS		
		Visual-spatial physical continuity	Visual continuity  Spatial discontinuity	Visual-spatial discontinuity
CENTRAL AXIS	Agriculture	2	4	2
	Pleasure	8	0	0
SECONDARY AXIS	Agriculture	7	1	0
	Pleasure	5	2	0
MARGINAL PATHS	Agriculture	8	0	0
	Pleasure	3	6	0
LONGITUDINAL SIDEWAYS	Agriculture	3	0	0
	Pleasure	3	0	0
FOREFRONT OF PAVILION	Agriculture	3	1	4
	Pleasure	7	1	0
NAZARGAH	Agriculture	0	7	1
	Pleasure	0	8	0
SUM	Agriculture	23	13	7
	Pleasure	27	17	0

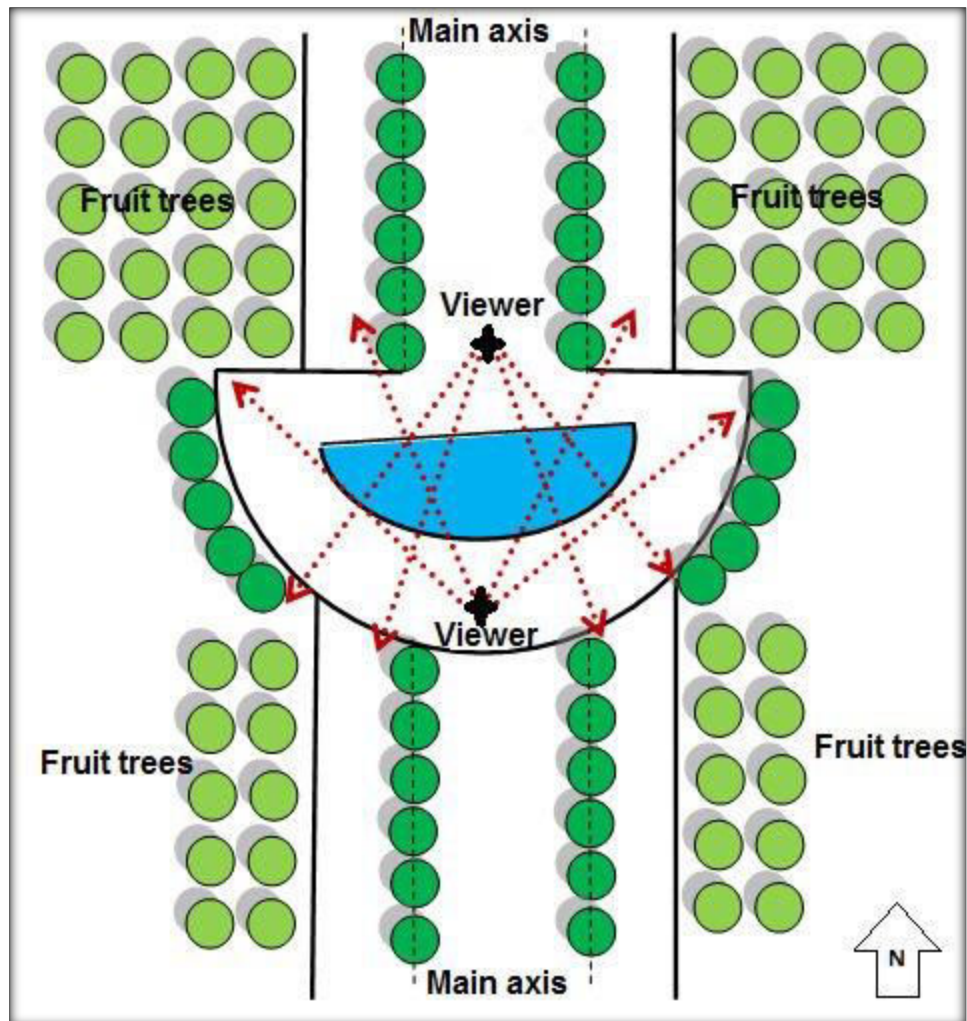


Figure 26. Environmental design the central zone of Rahim-Abad in which the cypress trees (dark green circles in the figure) provide four open views to the edible-bearing plants, demonstrates the visual integrating of the ornamental and fruit trees in traditional edible landscaping. While the structural plants (dark green circles in figure) impede the visual continuity between the visitor and fruit trees in the main axis, the visual continuity has been prepared in the heartland of the garden, by composing the pleasure elements (water, ornamental frame and background, and sky) and productive trees (light green circles in figure).

## Discussion

Firstly, the results of the assessment demonstrate that the visitor access and connection to the interior greenery of the Persian gardens contains a broad spectrum of physical accessibility to the

visual discontinuity. Secondly, the Persian garden may not be perceived merely from a unique outlook, but the movement as well as positioning in various viewpoints, are the essential tools for understanding the interior landscape of the garden. Thirdly, conserving the genuine human-greenery contact policies in historical gardens depends on the quality of protection disciplines of the original planting system as well as the visual regularity.

The aggregated outcomes indicate that inside the Persian garden environment, the primary axis, which is the backbone of the garden structure is the significant position for physical accessibility as well as visual-spatial continuity between the visitor and the inedible greenery. On the other hand, the physical accessibility to the edibles is supplied through the secondary and marginal walkways.

As a point of view, the visitor who stands in front of the pavilion towards the central axis has visual-spatial contact with the pleasure greenery, while, the visual-spatial continuity with the utilitarian fields is interrupted from this outlook position. It could be an indication of formal spatial design in governmental and administrative gardens. On the other hand and from the “*Nazargah*” outlook, it is possible for the spectator to have the visual connectedness to both types of gardening (pleasure and utilitarian) at the same time. Thus, *Nazargah* is a symbol of sovereign dominance over the garden as well as maximization of the visual acquisition of the interior landscape.

The other important point is a contradiction between the visual connection to the edible and inedible plants. While, observing the structural plants (pine, cypress, plane tree) from the various standpoints is possible, the visual connection to the edible plants is limited by certain positions of the visitors. In fact, the accessibility and connectedness to the edibles are less than to the ornamentals, physically, spatially and visually.

Furthermore, based on the achievements of this survey, studying the history and attributes of each garden and conducting the interviews with the gardeners, garden managers, and garden consultants, the key features of the case studies based on spectator-scenery connectedness was concluded. As previous tables demonstrate, each traditional garden has its particular features in the accessibility to the fruitful fields to the visitors.

In Birjand’s administrative and ceremonial gardens (Akbarieh, Rahim Abad, and Amir Abad) and due to the creation of an official and formal open space, the visual connectedness of the visitor

in the central axis with the agricultural sceneries is interrupted or at least weakened up to the front of the pavilion. This spatial interruption has been provided by the planting order at two edges of the central path of the Akbarieh garden, which consists of three rows of densely planted trees and shrubs. But in Rahim Abad and Amir Abad gardens, this goal has been attained by dividing the main axis into three sections, where normally the formal path is the central one, and the two other longitudinal sideways were attributed to the functional-agricultural movements. Accordingly, the official identity of the space has been provided by controlling the visual connectedness to the agricultural fields.

In the Shahzadeh garden, which was residential of a Qajar prince, usually many official meetings with governmental authorities and foreign ambassadors were carried out. Here it was inevitable completely to disconnect the visual-spatial relationship from the central axis to the edible landscape.

In Dolat Abad garden - and due to the elimination of some structurally tall pines (*Pinus brutia*) from the forefront of the pavilion - the spectator has the visual connection to the edible landscape from this viewpoint.

Owing to the residential-productive identity of Pahlavanpour garden, the visual continuity of a passer's view from the central walkway to the agriculture fields has been supplied. In other words, this garden does not have the quality of formal and official plant-and-visual system as the governmental gardens. The visitors' eyes find the fruit trees from the main axis, and by passing an intermediate space (line of plane trees beside the water stream) picking the fruits is possible.

Last but not least, in Fin and Bahlgerd gardens, due to the plant system destruction, the viewer-scenery connection system has been devastated. Hence, the importance of the conservation of the original plant system becomes evident, concerning the correlation of visual regularity, physical accessibility and plant systems in Persian gardens.

Table 13. The characteristics of the gardens based on spectator-scenery connectedness

<b>Characte ristics</b>  <b>Garden</b>	<b>Agriculture landscape</b>	<b>Pleasure landscape</b>
<b>Akbariye</b>	Visual-spatial discontinuity from the central walkway, inaccessible the edibles from the main axis	Visual-spatial continuity from the central axis, sideways, and in front of the pavilion viewpoints
<b>Rahim Abad</b>	Visual semi-continuity from the main walkway,  visual-spatial discontinuity from the front of the main building	Visual-spatial continuity from the main axis, sideways, and the front of the pavilion viewpoints
<b>Amir Abad</b>	Visual semi-continuity from the central axis, visual-spatial discontinuity from the front of the central pavilion	Visual-spatial continuity from the primary and secondary routes, and front and back of the pavilion
<b>Dolat Abad</b>	Visual continuity from the main axis,  visual-spatial continuity from the front of the pavilion	Visual continuity from the secondary paths
<b>Pahlavanpour</b>	Visual continuity from the central walkway, visual-spatial continuity from the front of the central building	Visual continuity from the secondary paths
<b>Shahzadeh</b>	Visual-spatial discontinuity and inaccessible the edibles from the central axis and front of the pavilion	Visual-spatial continuity from the central axis, secondary and marginal routes, and front of the main building
<b>Fin and Bahlgerd</b>	Visual-spatial continuity from most viewpoints due to destruction of the original plant order	

## Interim conclusion

Iranian garden designers, beyond the landscaping and creating diverse sceneries, have provided the multiple uses of the gardens as a place for pleasure and agriculture, so that, diverse outlooks, as well as diverse patterns of spectator-scenery connectedness, are considered. Thus, discovering

the viewpoints - as the significant tool for outdoor recreation and intuition - is essential for interior landscape perception in Persian gardens.

The results of this study answer the proposed questions. At first and concerning the achievements, the visitor connectedness to the edible and inedible landscapes inside the Persian gardens is different. All of our case studies in which the original planting system had been conserved, shows a distinct differentiation between the spectator accessibility to the agricultural fields and the connectedness to the pleasure scenes. Secondly, in comparison, these eight gardens demonstrate that the policies of spectator-scenery relationship in different gardens are a result of the original function of the garden. In other words, each garden has been created for some specific and multilateral intention. The specific intentions make the different policy of the visitor- greenery accessibility from the viewpoint of the connectedness to the edible and inedible green spaces.

On the other hand, and to answer the third question of this study, the simultaneous use of gardens as places for relaxation, administrative meetings, and ceremonies, makes them an appropriate model to determine the specific codes and rules to integrate the edibles into the landscapes. As a principle, the restorative use of the parks and landscapes would not be conflicted with their productive function, although, it will be anticipated that the economic products in public spaces will only be used by the members of the initiative community, family or practitioners, or as the municipal gifts to guests visiting the spaces.

Accordingly, a total comprehension of these eight case studies can be a way to introduce some of the principles of designing the edible landscape. While the integration of edible plants under the particular system named urban agriculture into landscapes and open spaces is being encouraged by some of the designers, the deficiency is recognizable principles, patterns, and concepts for landscape designers. Iran's historical gardens can be studied to derive some determined ideas and designs. Furthermore, the diverse accessibility patterns in different Persian gardens can be utilized as the concepts for designers who try to integrate edible plants into open spaces, like these:

- Possibilities of the integration of the commercial agriculture into the landscapes and at the same time segregation the fruit fields from the publics' eyes,
- Management of the visitor-agricultural landscape connectedness,
- Qualitative and quantitative separation of the access to the edible and inedible landscapes,

- Separation of the common recreational fields from the agricultural beds, spatially and physically,
- Full spatial-visual and physical interruption of the edible landscape of the formal axis in official spaces,
- Relative interruption of the fruitful scenes of the semi-official spaces,
- *Nazargah*, a concept for visual connection of the apartments and social housing with the agricultural fields,
- *Nazargah*, a concept for the sovereignty manager center of the productive urban landscapes.
- Separation of the ordinary pedestrian spaces and the casual agricultural walkway in continuous productive urban landscapes (in accordance to the Amir Abad and Rahim Abad Gardens),
- Proximity the inedible and ornamental plants to the crowded and official spaces,
- Planting the fruitful species besides the little traffic and informal spaces

Finally, the benefit of understanding those gardens at this level is recognising the importance of genuine planting design, understanding the correlation between the plant order, physical availability and visual regularity in historical gardens and the dissemination the innovative aspect of Persian gardens' design, which is the differentiation of the spectator connectedness with pleasurable and agricultural sceneries. Also, these findings can be utilized in new agricultural landscape planning and design by applying the traditional solutions for controlling the physical availability as well as visual-spatial connectedness to the edible landscapes.

*Table 14. Extension the Persian garden system of differentiate accessibility to the agriculture and pleasure greenery to future landscape and open space development*

Hierarchy of access routes	Plants species	Planting design	connection to the non-fruit-bearing plants	connection to the fruitful plants	Function in landscape
Main axis	Exclusively tall, shady, Non-fruit-bearing plants with emphasis on evergreens	Linear and official organizing the plants	Physical and visual connection with ornamental plants	lack of physical-spatial visual relationship with productive plants	Mainstream walkway, the axis between the main sectors of space to each other, the backbone of the system of hierarchical access
First degree bypass (secondary routes)	A mixture of ornamental fruitful plants	Linear organizing system	Weakened physical relationship with ornamental plants	Strengthen the accessibility to the agricultural plants	Connection the main axis (official walkway) to the marginal axes
Second degree bypass (marginal axes)	A mixture of ornamental fruitful plants	Linear organizing system	physical connection with near ornamental plants, visual connection to the main axis plants	Strengthen the physical-visual connection with the agricultural plants	Providing the accessibility to the margins of the landscape, connection the first degree bypass to the third degree bypass
Third degree bypass (between the rows of fruit trees)	Exclusively the agricultural plants, fruitful trees	Network organizing system	Only visual connection to the main axis plants	Physical-visual connection to the edible plants	Providing the accessibility to the yields, agricultural operations



## **Chapter 5 : Distinctive Features of Productive Landscape in Persian Garden<sup>4</sup>**

In this chapter we analyze the Persian garden plant system from the viewpoint of the integrative fruitful-decorative landscape and aim to introduce the Iranian version of planning and designing agricultural landscapes. It has been proved that the Iranian garden is a multi-functional space in which the plant system and green elements not only provide beauty and food but also possess the multilateral functions. In general, the Iranian garden's green space and green elements can be divided into two categories: fructiferous which is the utilitarian agricultural greenery, and ornamental which is recreational and pleasure gardening. Each of these two types of vegetation is distinctive in plant species, plant location, planting design and operation, and visual effects. In this chapter, the author will discuss the distinctive features of the fruitful-agricultural greenery in some selected Persian gardens in Iran. Furthermore, based on the field studies and analytical descriptive methods, this chapter will introduce three first hand and fundamental characteristics which can be the characters of the urban agricultural phenomena in future urban agricultural landscape planning and design.

It has been confirmed that the Persian Garden (*Chahar Bagh* model dating back to the 6th Century BCE) is original in its conception, and different from all other typologies in terms of selected concrete examples in design principles, layout, architectural features, use of vegetation and natural elements, water management, and symbolic meanings and uses (Khansari, Moghtader, & Yavari, 2004; NBPGO, 2011). The perfect design of the Persian Garden, along with its ability to respond to extreme climatic conditions, is the result of inspired and intelligent application of different fields of knowledge including technology, water management and engineering, architecture, botany and agriculture. The Persian Garden has been acknowledged as a masterpiece of human genius by numerous historians and travelers over the centuries (e.g., Chardin, 1711). The oldest evidence of the innovative character and the originating principle of the Persian garden is seen in Pasargadae (6th century BCE). Here, the wise management of water, careful selection of plants and garden layout based on straight and orthogonal lines were already present. The

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<sup>4</sup> A summary of this chapter has been published in the proceedings of *6<sup>th</sup> International Conference on Landscape and Urban Horticulture* (Athens, Greece). Consequently, a four-page paper will be published in *Acta Horticulture Journal*.

subdivision into four areas around two orthogonal lines – or *Chahar Bagh* – finds its roots in *Zoroastrianism* and is associated with the four elements, the four gardens of Creation and the four rivers of Paradise (NBPGO, 2011). The Persian Garden is, in fact, considered to be the symbolic representation of Paradise on Earth. It has evolved throughout the centuries in diverse forms, adapting to different aesthetic, functional and social exigencies and climatic conditions, its originating model always remaining intact. The arid climate of most of the Iran forced garden builders to elaborate ingenious systems to obtain and channel water from the source to the gardens.

## **Multifunctional landscape of Persian garden**

Previous research studies and the field studies of this research show that the Iranian garden is a multi-functional space. Plant elements and plant systems naturally go beyond providing beauty or food and additionally provide the multilateral functions. Fruits and vegetables even are grown in the royal garden which indicates even the royal gardens were intended to be productive. “Moreover, due to their economic values, gardens were considered significant properties in administrative contracts ... While the majority of gardens contributed to their owner’s income or larder, they also played an important role in the recreational setting for private and public use” (Gharipour, 2013: 139). Vegetation in the Persian garden consists of trees (evergreen or deciduous), shrubs (with or without flowers), bushes and flowers. Trees were carefully selected to provide shade and reduce the rate of evaporation. They were essential in maintaining the micro-climate of the garden about its hot and arid surroundings. The vegetation of the garden includes fructiferous and non-fructiferous trees, bushes, creeping plants, and flowers, especially roses.

Thus and in general, the Iranian garden’s green spaces and green elements can be divided into two categories:

- ***Fructiferous:*** *edible, agricultural and utilitarian greenery*
- ***Ornamental:*** *inedible, recreational and pleasure greenery*

Each of these two types of vegetation is different in plant species, plant location, plant design and operation, and visual effects (Shahchraghi, 2013). In fact, thinking about improving the efficiency of the valuable environmental facilities and the importance of obtaining water from the

far distances, proves that both greeneries are important, and have a great role in the function and purpose of the garden. It can be called the landscape personality or landscape character. In this respect, the Persian garden design has less been considered, and that is a recognition the personality of greenery from the perspective of differences between the productive and ornamental green spaces and circumstances of the integration two types of greenery in the built environment system which is called Persian garden.

Surveying the Persian Gardens demonstrates that the features of the productive landscapes could be categorized into three distinct groups of attributes:

- Landscape personality
- Landscape identity
- Landscape accessibility

### **Landscape personality**

Evans, Salway, and Thackray (1996: 39) believe “Particular landscapes possess a distinctive personality.” They added: “the property can be divided into character areas, which is definable areas with unique aesthetic characteristics” (p. 203). In Persian garden both the agricultural and decorative landscapes are characterized by the following features. This character can be named the landscape personality. The landscape personality of agricultural planting is distinguishable from the personality of pleasure gardening. But the landscape personality of a typical Persian garden is integrative greenery which consists of two sub greeneries.

### **Plots or planting spaces**

Spaces and plots (in Persian: kart) which are intended for fruitful or ornamental plants are distinctive and have special features such as spatial placing which demonstrate the importance and characters of the two types of greeneries in the Persian garden. These features are as follows:

## Independent planting spaces

Except the axes or trails, hardscape properties such as buildings and water features, and the plots which were devoted to the ornamental plants, the productive greenery with its meaning and identity of agricultural production, has the large plots around the main axis. Despite the ornamental-recreational planting which forms the main axis and frame of the garden, separates the spaces and controls the visual system (Jayhani & Emrani, 2007), the productive plants have their specified plots which are broad and long and have been specifically allocated to agricultural phenomena and production horticulture.

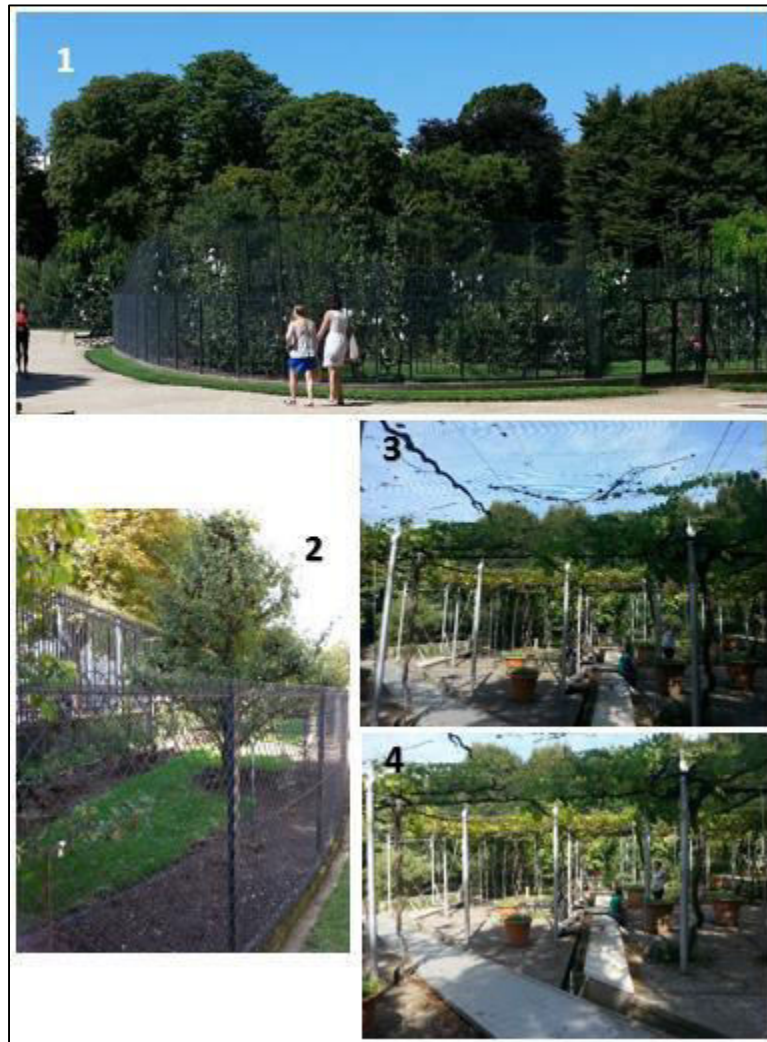


*Figure 27. Independent, large and continues planting spaces (yellow dash line) of productive landscape in Akbariyeh historical garden in Iran*

## Large planting spaces

The large and impressive aspect of decorative landscaping which consists of non-edible plants (food plant) is in the length of the central axis and the frame working of the plots. But the productive and agricultural spaces have the great width and length from wall to wall (longitudinal and latitudinal). Therefore, unlike Luxembourg Garden (Jardin du Luxembourg) and the Parc de la Villette in Paris, the productive spaces in Persian gardens are not the spot spaces, rather the agricultural planting spaces are larger than the decorative. Despite the nonproductive green

elements which shape the long paths and cover them, the productive green features make the significant volumes which can be observed through the plan of the garden of which the surface has been covered by the garden's edible vegetation.



*Figure 28. Despite the Persian garden, in French gardens the productive green spaces are limited to some spots and wired (in Jardin du Luxembourg, images 1 and 2) or is not continued across the landscape (in the Parc de la Villette, images 3 and 4); Photography by the author, summer 2015.*

### **Continuous planting spaces in the length and width of the garden**

The planting plots in length and width of the garden continue so that the observer in the garden has contact with the greenery and the planting spaces by passing from wall to wall. Thus, the most important attributes such as the presence of fruit bearing trees and edibles are not limited to the points, rather it continuous in the planting spaces across the length and width of the garden.

Therefore, the principle of continuation of plant presence shapes the landscape character, both the recreational and agricultural.

### **Permanent planting spaces**

One aspect of sustainability of environmental planning and design in Persian gardens is to create permanent planting spaces. In fact, the placement and designing of the plots show the sustainable and holistic thinking to create a multi-functional built environment which is based on the expected functions. So, the location and perimeter of the planting plots is constant and does not change during the time. In this respect, the stability and rigidity of the species story the landscape personality.

### **Independent and distinctive functions**

Persian garden's functions can be grouped into two categories: tangible and intangible. Political-cultural functions are intangible. For example, the existence of firstlings was the reception material for local officials, and foreign ambassadors who amused in Birjand's gardens, and so is a political function of the productivity (Saberifar, Karampoor, & Halajmoghadam, 2014). But services such as welfare, spatial definitions, security, and safety, as well as the visible beauty are the tangible functions of the landscape. Although the function of the Persian garden is the result of the systematic presence of two types of fruitful and ornamental plants, the systematic operation of these two greeneries, their inner harmony which produces multilateral products, each of those green spaces has independent functions which demonstrate the different personality of each other.

### **Visual function**

- Productive landscape: changing landscape, landscape of shapes and volumes, sunny greenery
- Ornamental landscape: stable landscape, background landscape, dark greenery

### **Functional performance**

- Agricultural landscape: yield production, edible, economic
- Ornamental landscape: decorative, comfort, recreational

### **Spatial functions**

- Productive greenery: filler elements of the plots
- Decorative greenery: separator of spaces, axes and frame maker

### **Edible-economic functions**

- Productive landscape: utilitarian agriculture
- Decorative landscape: pleasure gardening

### **Recreational functions**

- Agricultural green space: Gathering for harvesting and nutrition (such as berry)
- Pleasure green space: walking, watching, thinking

Operations of fructiferous and ornamental plant systems can be considered in several aspects which show the profound and distinct differences of the personality of each of them. But the nature of the garden has both characters of agricultural production and recreational comfort.



*Figure 29. Differences the sunny productive fields versus the shady non-agricultural walkways in Akbariyeh garden, Iran*





*Figure 30. Positioning the open space furniture near to the mansion, under the shady trees and in contact with water features in the recreational zone, Akbariyeh World Heritage garden, Birjand*



*Figure 31. Visual and functional differences and contrasts between the Cypress and fruit trees in Rahim Abad historical garden in Iran*



## **Permanent plant elements**

One of the distinctive aspects of the garden is permanent vegetation, both in the pleasurable horticulture sector and also in the utilitarian agriculture. In fact, the plant elements are persistent (as compared to herbal elements such as flowers, shrubs and grasses), and even in the case of declining a green element, the planting location is permanently assigned to that element and thus, a dead tree or infested site will be replaced with new trees. Therefore, the visual landscape does not change a lot in the garden (Pirnia, 1994). Also, it should be mentioned that both the decorative and fruit bearing trees' elements have been planted under the defined order which is the geometry of planting in the space and regarding it over time is a factor in the distinction to the landscape personality.

So the subject of consistency has different aspects. One aspect is permanent planting geometry and permanent planting location, as well as insisting on planting the trees instead of vegetables or temporary vegetation. The recent aspects are both being applied in decorative and productive greenery. Contrary to the fact that in agricultural green spaces the most of the spaces were being allocated to the trees as the permanent plant materials, the multistory planting design led to accommodate less percent of the spaces to raising the crops, vegetables, forages. Stability of trees, the permanency of planting space, and the stability of planting geometry emphasizes the significance and personality of the productive landscape in the structure of Persian gardens and its built environment system.

## **Distinct planting design**

The other aspect of the differences between the pleasure gardening and utilitarian agriculture is their variation in planting design. The planting design of decorative elements which are axis-makers, green wall-makers and frame-makers are under the linear spatial organization (Jayhani & Emrani, 2007). In Fin garden, the planting of dense rows of cedar trees along the principal axes has given the garden an apparent order and spacing and a compactness which is particular to that garden. Subsidiary walkways contradict this feature and give a sense of openness to the garden. Tall trees at the boundaries separate the garden space from the exterior and help create a micro-climate favorable to the growth of fruit-trees and flowers.

By implementing this organization system in the whole garden, it is divided into the spaces, introducing the plots and axes, zoning the regions, and aggregating the intersections which make the network spatial organization (a grid of tree-lined streets).

On the other hand, the planting design of productive elements, under the effect of irrigation and agricultural styles, has the grid geometry which means the trees are organized on a network of points that cross each other to form a series of squares or rectangles (Shahcheraghi, 2013). Therefore, the linear order of decorative and structural trees shapes them as the axes, vertical green walls, and the grid geometry of productive species produces the green volumes (following figure).



*Figure 32. Comparison the linear planting design of the structural trees (top pictures) which are axis- and wall- maker, in versus the planting of the fruit trees (lower photos) on a grid network geometry which produce the green volumes; Masoumieh historical garden, Birjand, Iran*

## Different management and maintenance procedure

Because the conservation and restoration of the fructiferous landscape consist of numerous affairs including water and land management, economic management, combating water scarcity and drought, horticulture and crop management, and today also tourism and leisure management, it can be different from the viewpoint of administration and maintenance to the pleasure landscapes. One of the critical elements that have been affected by the developments in the management of gardens are crops and productive infrastructure. Ornamental plants such as pine and cypress have a greater resistance to environmental stresses and therefore need less care. The agricultural section for which productivity, stability, and economic viability rely on the traditional knowledge and agricultural managements and many care operations during the seasons.



*Figure 33. Deterioration the fruit trees, and staying empty the crop fields despite the stability of Pine trees demonstrate the different management and maintenance procedure in the productive and pleasure landscapes in historic gardens, Masoumieh, Birjand, Iran*



## Different and distinct environmental design

The main physical components of the garden are the surroundings, walls, entrances, the *Chahar Bagh* (which is also the original principle of all gardens), the two axes, water and related elements, vegetation, shade, and architectural features such as pavilions (NBPGO, 2011).

In the spatial planning and environmental design of Persian gardens both, the productive and non-productive atmosphere can be recognized. For example, in Chehel Sotun garden the pool is the most important manifestation of water in the recreational zone. On the other hand, productive green spaces, which consist of planting plots have a different relationship with the buildings, axes, water, walls, etc., than the unproductive spaces, and therefore their environmental design criteria are different. These distinctions for the environmental design with examples of field studies are as follows.



*Figure 34. Differentiated environmental design of the recreational part of the garden by utilizing the effect of visual water feature, tall and shady plants, and paved walkways (left) versus the fruit fields by emphasizing the agriculture landscape personality (right); Dolat Abad World Heritage garden, Yazd, Iran*

### Paths and walkways

Based on the hierarchical access system there are first-grade axes, which are meant as recreational routes and second-grade axes as the agricultural trails and paths. Therefore, the principal axes of the garden are organized in pleasure greenery that includes the main route for passing and movement and therefore has a greater width. The edges of these main paths are framed by planting of non-food species and structural plants. In addition to connecting the user to the central building of the garden, the function of the first-grade axis is to strengthen the backbone of

the garden as the primary organizing element of the space. On the other hand, the paths of the agricultural spaces that are narrower and also not paved, provide a way to enter and move in the manufacturing sector of the garden with the edible plants.

### **Contact with the water**

Water is a central element of the garden and plays both a functional and aesthetic role. Water is present in the original bi-axial structure of the *Chahar Bagh*, as the axes are formed by the central pool and the main waterways, which are subdivided into smaller channels or brooks. Fountains are used to draw attention to the sources of water. Water features include the pool at the intersection of the two axes, waterways, fountains, brooks and channels. The water supply, management and circulation systems from the source to the garden, including all technological and decorative elements that permit the use of water for functional and aesthetic exigencies (NBPGO, 2011).

The quality of the relationship of the recreational spaces with water is different to the productive spaces. The recreational environment consists of various zones in a Persian garden and includes the main axes, the open space in front of the mansion, the mansion's recreational backyards, and the open spaces at the entrance. Each of these zones can be categorized as the non-agricultural spaces and accommodate different forms and quality of the visual presence of water.

The visual presence of water in the main axis is made through streams of water, whereas in the open space in front of the pavilion a pond and a fountain can be found. Thus in the nonagricultural spaces the water has a more aesthetic and pleasurable effect. But in the productive plot that outward presence of water becomes inward which shows the economic importance and the utilitarian focus on natural resources. So, there are no visual effects of water in the fruitful landscape except the traditional system of transmitting the water from the principal axes to the sub-plots to irrigate the agricultural plants (subsequent figures).

Table 15. Comparison the environmental design's differences between the pleasure and productive open spaces in the Persian garden

Environmental design characteristics			
Pleasure landscape		Productive Landscape	
<b>Planting design</b>	High density	Low density	<b>Planting design</b>
<b>Plant species</b>	Structural, tall, shade-maker trees	Edible producers plant, fruit trees	<b>Plant species</b>
<b>Contact with water</b>	Visual-pleasure presence of water	Not present the water features	<b>Contact with water</b>
<b>Contact with buildings</b>	Direct contact with the mansion	Contact with the wall of the garden	<b>Contact with buildings</b>
<b>Plant diversity</b>	Low plant diversity	High plant diversity	<b>Plant diversity</b>
<b>Walkway design</b>	Wider and paved	Narrow and unpaved	<b>Walkway design</b>
<b>Recreational furniture</b>	Benches and couches	Not having	<b>Recreational furniture</b>
<b>Shade design</b>	Shady open space	Sunny open space	<b>Shade design</b>
<b>Sidewalk plants</b>	Shady and tall trees, marginal plants	Mix of fruit and structural plants	<b>Sidewalk plants</b>

## Planting

The planting design of recreational spaces are as follows:

- **Main axis:** the linear organization with an emphasis on evergreen species, high and shady plants, low plant diversity, and non-fruitful plants
- **In front of the mansion and its outdoor:** central organization, the plots for accommodating the flowers and herbaceous plant species

- **Private recreational spaces such as private courtyards behind the main building:** a combination of linear and central organization and integration of the structural canopies, shrub species and roses
- **Open spaces before entry gate:** continue the linear organization of the mainstream and non-fruit varieties

The planting design of productive spaces are as follows:

- **Plots:** network organization with emphasis on allocating each plot to the single fruit or similarly limited species from the viewpoint of management
- **Plots:** Linear organization with a focus on planting trees on tracks that have been formed under linear geometry.



*Figure 35. The presence of visual water near the main building, or in the middle of the main axis in designing the recreational zone versus the invisible existence of water in agricultural landscape in Persian garden*





*Figure 36. The presence of visual water near the main building or in the middle of the main axis in designing the recreational open spaces versus the invisible existence of water in agricultural landscape in Persian garden*

### **Relationship with the buildings**

There are various types of buildings in the gardens. Almost all of them have been constructed outside of the productive greenery, in the recreational zone. In fact, one of the main spatial share of the recreational zones has been allocated to creating the various types of buildings including: the main pavilion, residential buildings, entrance building, service buildings, servant residential, barn and stable, and the garden wall which except for the wall and some of service land uses, do not have physical contact with the agricultural plots. The walls are a necessary component that ensures the protection of the plants and flowerbeds from wind and dust. It should be mentioned that there is no general rule about all of the gardens, and the genuine function of the garden, especially in the residential-productive gardens, the physical contact of the buildings with the



fructiferous plots may be reinforced. The planting design of the open spaces around the palace, pavilion, and generally the main building of the garden has been devoted to the ornamental and shady plants, visual water features and flowers, which provide an open perspective to the central axis (Pirnia, 1994).



*Figure 37. Specific environmental design in front of the mansion by using the water features, ornamental flowers, and visual landscape (top) versus the agricultural environmental design in the productive fields (below) in the Akbariyeh garden*

## **Landscape Identity**

Nogué and Vicente (2004: 113) describe: “Landscape is the result of a collective transformation of nature. It is the cultural translation of a society on a particular portion of nature, and this translation is not only material but also spiritual, ideological and symbolic. In this sense, landscape acts as a center of meaning and symbolism, and creates a sense of belonging and a territorial identity that is particularly strong in some nations”. Thus, “Landscape identity is the unique psycho-sociological perception of a place defined in a spatial–cultural space” (Stobbelaar & Pedrolí, 2011). Another characteristic aspect of the productive greenery of Persian garden is its identity and root into the national culture and religion, solidarity with society, and even its climate and context identity. The landscape identity of the edible landscape in Persian garden divides into three subcategories: cultural identity, climate identity, and contextual identity.

### **Cultural identity**

#### **Relationship with traditional agricultural and horticultural treatises**

During the history, and especially in the Islamic civilization eras, many treatises of the Islamic scholars were about the botany and agricultural issues, which some of the primary sources have been pointed out by Ruggles (2008). The continuation of this culture in Iran led to producing and publishing the agricultural knowledge books. Interestingly, the conformity of the Persian garden design system with the principles and criteria of gardening mentioned in traditional books, illustrate the continuation of written culture in designing the cultural landscape and tell us about the endogenous relationship of the garden design and its cultural originalities. Checking some Persian language books such as *Irshad al-zira‘a* (Guide to Agriculture) written in 1515, and *Ma‘rifat-I filahāt* (Twelve Chapters on Agriculture) written by *Abd al-‘Ali Birjandi* (deceased in 1527) demonstrate the importance the knowledge of agriculture and fruit trees as well as utilizing the arable land and water in traditional thinking. Those resources have taken into consideration the principles of planting, maintaining and harvesting the vines, olives, apples, figs, pomegranates, almonds, walnuts, pistachio, peaches, pears, palms, oranges and so on, and at the same time mention their medicinal and health properties. Therefore, the agricultural landscape in the Persian garden structure is a continuation of the written culture in spatial and environmental planning and design.

## Relationship with the culture of the society

The edible landscape of Persian garden as Nogué and Vicente (2004) describe is largely a cultural landscape, a social product, and the cultural projection of a society on a specific space.

### Nutritional culture

Iranians grow those plants in productive landscapes that harmonize with their food culture. Coordinating the climate needs of the Barberry (*Berberis vulgaris*) with the South Khorasan's soil types and climatic characteristics (Eastern province in arid regions of Iran neighboring with Afghanistan) led to spreading this species both in fruitful greeneries and the food culture of the people of this region. It is also the same with the saffron and medicinal herbs which show a systematic approach appearing in the natural capabilities in plant raising, and continuity to those grown plants in the food culture of the people (Barabadi, Rajabi, & Shoeibi, 2010). That shows the systematic coordination of the productive greenery with the food culture of the society. The other example can be continuity of the nutritional behavior of that society with feeding species such as jujube, pomegranate, barberry, saffron, date, turnips, cumin, sugar beet, sesame and cannabis and a variety of fruits and melons in South Khorasan Province.



Figure 38. Continuity the natural opportunities and constraints in planting selection, making the edible greenery and nutritional culture in Southern Khorasan province of Iran

### The culture of hospitality

One of the horticultural politeness is inviting the guests to the garden in the season of maturing the first fruits such as berry picking and spending and offering some pieces of the yields to the

visitors, elites and notables and officials. In fact, both the choice of fruitful elements and the philosophy of productive landscape supports the culture of hospitality, which reinforce the consistency of the relationships within the community. Local authorities of a town or village, like teachers and professors, are invited by a gardener or farmer or landowner to his/her garden to be catered by the first fruits such as berries. It represents the significance of productive greenery for the culture of hospitality among the Iranians.

### **The culture of production, contentment and frugality**

In the formal and informal gardens not only species for decoration were planted, rather the plants had a production dimension that was offered to the relatives of the garden owners or returned to the gardeners as their wage (Ruggles, 2008). One of the reasons for developing the gardens was the economic policies and the use of the products (Heidarnattaj & Mansouri, 2009) and a self-sufficient society (Naghizadeh, 2013). Accordingly, the concept of economic usefulness makes the fruits critical (Motedayen, 2009). Also, the remoteness of some cities (such as Tabas) of the fertile cities, encouraged the local people to produce fruits and vegetables in their gardens (Daneshdust, 1990). One example of the economic perspective on the landscape is planting the saffron in Brijand's garden. Because of the low demands of this plant to the water (as a scarce resource in Birjand) it has doubled the economic performance in comparison to the other agricultural products and makes an invaluable income for the owners and gardeners (Barabadi et al., 2010). Therefore, the need for self-reliance of local communities to the local agricultural production, the need for economic utilization of water, land and labor, have provided the socio-economic context of planning and designing the fruitful greenery in historic gardens.

### **Relationship with religious and ritual culture**

#### **Culture of ritual devotion**

One of the religious beliefs of Muslims is the culture of ritual devotion which means dedicating the agricultural land, their yields, and profits, and revenues to be spent on good things. Islamic devotion (*Waqf*) means the eternal gift for the public service (with or without keeping the property's ownership right) and using the benefit of something to do well and to the love of God. In fact, that is an inalienable religious endowment in Islamic law, typically donating a building or

plot of land or even cash for Muslim religious or charitable purposes with no intention of reclaiming the assets (Haaerei, 2014).

The culture of ritual devotion has several interrelated systematic relationships with the agricultural landscape. First, the necessity of continuation the environmental benefits such as land and garden requires cultivation the valuable and economic crops over time which the clear example is productive greenery. In addition to this aspect, planting fruit trees such as berry on the fringes of urban and rural roads was another aspect of the dedication to Iranian culture that has affected the streetscape and was a visual culture of designing the edible plants along the street. Another aspect of the relationship between the landscape and the garden owner is the harvesting of the fruit trees they planted, although some branches and twigs are also accessible by the public from the public paths.

#### **Culture of beneficence**

In Islamic culture, a careful manner even to animals and insects such as ants or birds has been emphasized, and rewards for goodness to the animals has been enumerated. In the various Islamic narratives, sinners have been mentioned who have been deliberated from the consequences of sin as the divine mercy because of rescuing an animal. This culture has taken into consideration the more emphasis on beneficence to the people, not only to Muslims, rather the goodness of humankind (Javadi Amoli, 2010). In traditional societies, a reasonable means of applying this culture and its continuity over time was farming and agriculture. The fruit could be devoted to the poor people, and the agricultural fields were an employment basis for the needy and the downtrodden castes. In the Holy Qur'an (Qalam Sura) the story is mentioned of the garden owners who prevented the needy people of using the landscape products, and so this meanness caused the descent of divine punishment and loss of all their products.

#### **Holy Quran and Islamic narratives (*Hadith*)**

One of the interesting points that most scholars have referred to is that the hypothesis of the concept of the Persian gardens is derived from the paradise descriptions as mentioned in the Holy Quran (Poorjafar et al., 2014; Gharipour, 2013). One of the common characteristic of these gardens with the heaven gardens is the plant elements. The sacred dimension of the Persian Garden also

depends on the importance that water and vegetation have in this arid land (NBPGO, 2011). In fact, in the Islamic tradition and the Quran, the emphasis is on the fructiferous species and the easy access to the edibles of paradise which is remembered as one of the blessings of God to the faithful Muslims. God has sworn to fig and olive (Tien chapter/verse 1) and other events, dates, grapes, pomegranates and bananas have been mentioned in the Quran. The Islamic narratives (*Hadith*) also emphasize on planting edible plant species, and therefore the presence of the productive plant species in the garden of Iran shows its coordination with the Qur'an and the traditions as well as a reminiscence of ritual and cultural identity.

### **Climate identity: accordance the landscape with the climate and ecological context**

#### **Adaptation to climate and water shortage**

Designing the Persian garden system in general, and the productive and ornamental aspects are specially adapted to the environment and its requirements. Criteria of this ecological adaptation and designing under the umbrella of climate identity has shown in the display of fruitful and decorative greeneries:

#### **Climate identity of productive green space**

- Planting the varieties of plant species which are resistant to environmental stresses (e.g., closed mouth pistachio in Akbarieh garden of Birjand)
- Localization of the sensitive species to the severe cold such as figs on the periphery and the side of the garden wall
- Selecting the high-value commercial plant species which are resistant to the environmental stresses such as saffron
- Environmental planning and design to maximize utilization of the sun
- Selecting the energy-efficient and resistant plant
- The possibility of infiltration of rainwater into the ground due to the lack of flooring, and furrow plots.

#### **Climate identity of ornamental green space:**

- Choosing the energy-efficient plant elements which are resistant, and can predispose the basis for constructing the built environment in dry and harsh environment such as pine and cypress
- Minimizing the visual appearance of water in the gardens of Birjand
- Green windbreak system of pine in Amirabad garden
- Plots of rainwater storage in Pahlavanpoor garden
- Covering the surfaces with colored stones in Golshan garden instead of using the high consumed cover plants
- Not constructing the floor surfaces of the paths to allow infiltration of rainwater into the ground

#### **Contextual identity**

##### **Continuation the agricultural character and natural talents of the region in designing the garden**

The character of the Persian garden as the multi-functional and productive recreational space is the continuation of agricultural and tourism potential of the region and in the geographical context in which the garden is located. In fact, by preparing and transmitting the water as the determinative resource for the landscape development, and adjusting the garden size based on the amount of water that is available, and localizing the garden in the context of agricultural lands and in connection to the rural or urban texture, it would be possible to construct an environment which is part of the nature (Khansari, Moghtader, & Yavari, 2004). The traditional garden products are the continued productions of the geographical area, and this indicates the contextual identity of the Persian gardens and its productive green space. The Pahlavanpoor garden produces the products of the cold region of Mehriz city. In Birjand, the historical gardens provide the agricultural commodities of the arid Southern Khorasan province in the east of Iran which are pistachio, pomegranate, grape, apricots, etc. Therefore, the continuity of agricultural identity of the

geographical region in the productive landscape of the Persian garden illustrates the contextual identity as the distinctive characteristics of edible landscaping in Iran.

## **Landscape accessibility**

One aspect of the productive scenery which has been less studied is the hierarchical access to the edibles. After entering the garden, the visitor stands on the main path in front of the main palace's garden. This route provides the path for leading the visitor to the main recreational zones of the garden which are covered by the ornamental plants. But accessing the edibles is channeled through the secondary paths to the plots. Contrary to the decorative plants, physical access to the fruits is not provided through the main axis. So, after entering in the main axis and passing through alternate routes, the spectator enters the paths between the rows of trees or peripheral route. Therefore, unlike the ornamental landscape that can be seen from all parts of the garden, the fructiferous scenery cannot be seen from some viewpoints, because of the policies that restrict the public access to fruits and fruitful greenery. It is especially the case in ceremonial-governmental gardens which have been the place for public traffic. For example in the Akbariyeh garden, by planting multi-layers (three rows of plants: bush-pine-pomegranate) at the main axis, the visual connection of the spectator and agricultural scenery is weakened.

Therefore, the policies of edible landscape accessibility in Persian garden are (Khalilnezhad & Tobias, 2015):

- Hierarchical access to productive greenery and edible yields,
- Planning the accessibility in a range of full physical access to the complete interruption of visual continuity,
- Access management through space planning, creative environmental design rather than through non-environmental design solutions (e.g. wired tours):
  - i. Separation the agricultural fields from non-agricultural spaces
  - ii. Separation the productive space of the central axis
  - iii. Classification and grading the routes and paths
  - iv. Layered decorative plants





Figure 39. Separation the agricultural fields from the ceremonial zone of the garden by the walkway and two layer of pine trees plus contemporary barberry and boxwood bushes in Dolat Abad garden (left), and restriction the access to the fruit trees fields by planting the triple layered trees (boxwood, pine, and pomegranate) in Akbaryeh garden (right)

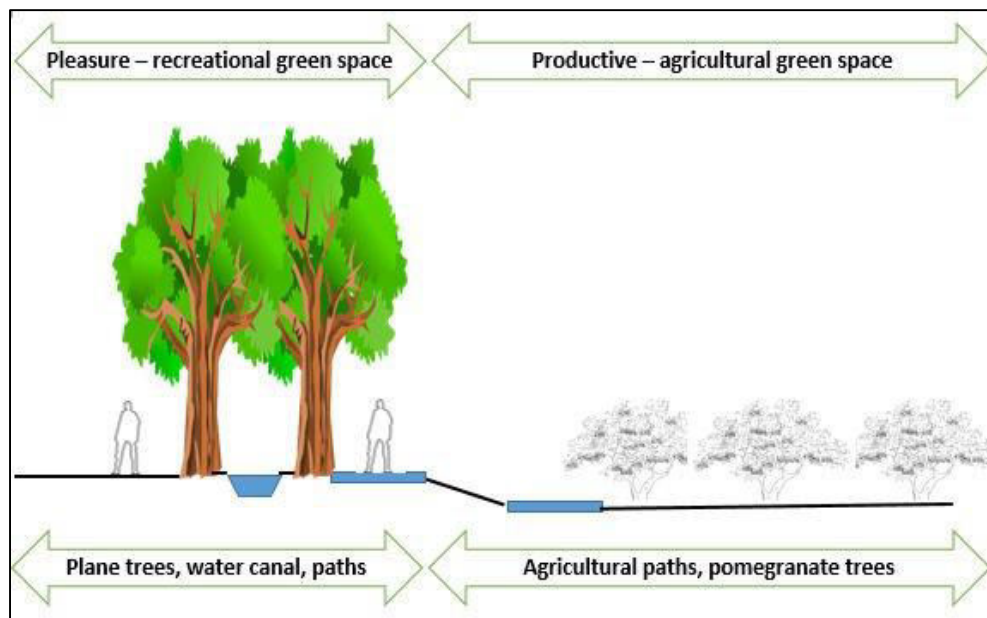
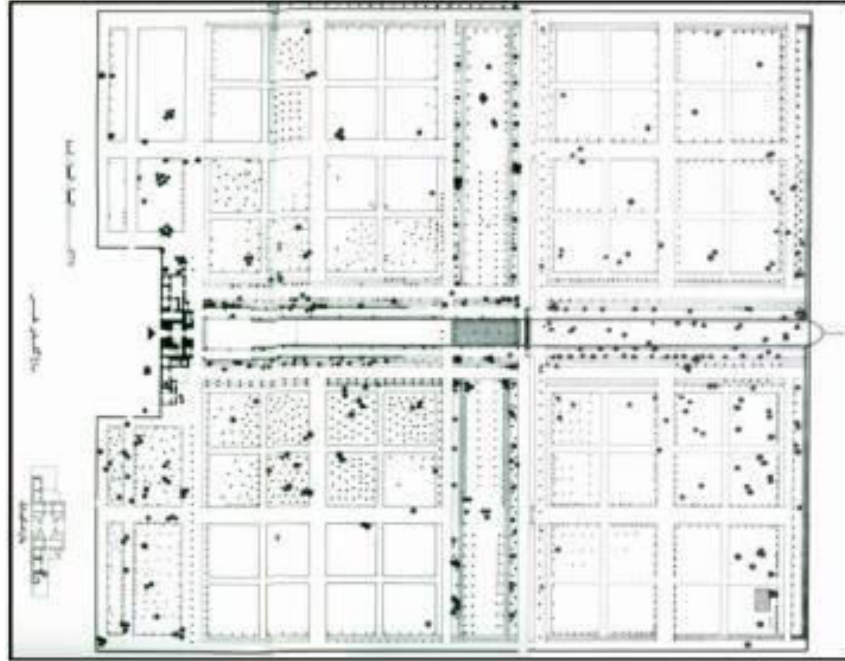


Figure 40. Schematic elevation of separation the productive space from the central axis; and classification the paths in Pahlavanpur World Heritage garden, Mehriz, Iran.



*Figure 41. Grading the width of the walkways from the main central axis (widest) to secondary passage (with the average width), and eventually the narrowest agricultural routs in Golshan historical garden*

## Discussion

Firstly, recognizing the landscape features and characteristics of productive greenery in historical gardens broadens the landscape designers' thinking about the architecture of urban agriculture landscape. The Persian garden experiences show that urban agriculture can be a phenomenon beyond the production. Because as mentioned in this chapter, personalizing the fructiferous, reinforcing the local identities, as well as an application the creative environmental design in access management, makes the edible landscaping the evolutionary theme in urban parks and green spaces rehabilitation and reconstruction.

Secondly, the achievements of other researchers reinforce the results of this study. For instance, from the urban forestry and urban greening perspective what would be the application of those introduced three productive landscape characteristics (personality, identity, and accessibility)? Because of 'urban foresters should take steps now to diversify the types of trees that are planted in cities to avoid catastrophic trees losses or massive and expensive tree protection programs' (Raupp, Cumming, & Raupp, 2006: 302) taking consideration into native fructiferous species beyond the diversifying intention can mainly emphasis on landscape identity and the geo-environmental

context of the city treescape. Furthermore, the idea of promoting cultural identification with the trees and landscape can be extended to the creation of cultural gardens in which the plants and landscape design reflect a distinct cultural theme, and can be designed, established, and maintained by the residents themselves on derelict and vacant sites and also within developed parks, open spaces, and school grounds (Johnston & Shimada, 2004). Thus, the traditional landscape features can be extended and continued in new landscape designing and open spaces development. Some species of trees have significant cultural and religious significance and can also be powerful symbols of historical landscape features in current modern contexts.

On the other hand, overuse of popular ornamental selections, however, could be problematic should any prove susceptible to serious, health-threatening insects, diseases, or abiotic disorders. Results from study of Iles and Vold (2003) suggest planting the same handful of shade and flowering tree cultivars over and over again makes for bland predictability in the landscape and could potentially result in the loss of a significant percentage of tree population should they prove susceptible to opportunistic insects, disease-causing pathogens, and/or abiotic disorders.

In Iran, today's managed landscapes are, in fact, mostly variations on a familiar theme, with little genetic diversity. Under circumstances like this, if the landscape designers or municipality policy makers desire to increase the treescape diversity by specifying a wider array of fruit tree cultivars for their projects, what would be the criteria for selection, the criteria of arrangements, and the strategies of access management? Therefore, the significance of Persian gardens should not be underestimated.

Apparently, fruit may not be desirable for some of the urban inhabitants, because the consistent concerns about the cleanliness of the street related to trees and damage to sidewalks and subsequent maintenance are concerns (Heimlich, Sydnor, Bumgardner, & O'Brien, 2008). However, the use of only a few species may result in an even-aged and nearly single species plantation that is not ecologically sound (Ning, He, Liu, & Abdollahi, 2008). But interestingly, the Persian garden guides us in a new way of landscape feature that a landscape designer can utilize an accessibility strategy for accessing to the fruit trees by putting them in behind the structural and ornamental trees which impede the landscape vandalism. From this perspective, for the inhabitants who use of green belt trails for walking, what landscape would be more surprising than the hidden local fruit

trees behind the favorite green elements? The Persian garden rules tell us that the location of fructiferous is not sidewalks or crowded routes, as well as the treescape diversifying can promote landscape identity. Thus, acquisition the aim of species diversity as one of the priorities in future planting and greening efforts (Ning et al., 2008) can be coincided with landscape identity by utilizing and retrieving the local and traditional green elements.

Thirdly, the role of Persian garden landscape features would be a principal and spatial link between the past and future landscape. The Iranian cityscape requires more innovative and creative approach to urban forestry and urban greening affairs. Here, the role of Persian garden by personalizing the agricultural landscape, reveals the future intentions for integrating the productive greeneries into the urban green spaces would not be limited to planting some fruit trees in urban parks. The landscape personality means permanent, large, continues planting fields which will environmentally be designed for creating a distinctive atmosphere in which the hardscapes and softscapes are fundamentally designed in a different way from the ornamental parks. Furthermore, the landscape identity guides the landscape designers to refer to their local plant's species, not only for demonstration, rather for revitalizing the local links between the tradition and plants, like traditional foods, traditional beliefs, and traditional linkage between the city and villages. Lastly, the landscape accessibility goes the green space architects beyond putting the fruit trees beside the walkways. It would be more attractive to the urban inhabitants and in particular for the children to discover the fructiferous in the landscape. Also, the management of the accessibility make the fruits more safe and secure and reduce the conceivable conflicts in green space maintenance.

## **Interim conclusion**

Persian Garden represents one of the highest achievements in the conception and creation of art. Philosophical, mythical and religious concepts, as well as literary and artistic aims, are materialized in outstanding tangible manifestations through the ingenious and skillful application of water management technology engineering, architecture, agriculture, and botany. The Persian Garden encompasses a variety of tangible manifestations, while always exhibiting an evident unity of conception in the use of the *Chahar Bagh* model throughout the centuries and in diverse climatic conditions.

Concerning the fact that the Persian gardens can have dual or multiple functions as sources of income and pleasure, introduces them as a reliable spatial-physical reference for discovering the criteria of designing the multiple-functioned landscapes and open spaces.

Based on the field studies and analytical-descriptive methods as noted in this chapter three first hand and fundamental characteristics of the Persian edible landscaping are introduced, which can be the characters of the urban agricultural phenomena in future urban agricultural landscape planning and design. In fact, the author tries to fill the significant gap in the introduction the principle of creating the edible landscape for landscape architecture as well as environmental design engineers.

As mentioned previously, these principles are landscape personality, landscape identity, and landscape accessibility, which are the three major characteristics of the utilitarian green spaces which are embedded in the Persian garden's spatial and physical system. The distinctive features of agricultural landscape personality differ from the ornamentals with permanent-large-continues planting spaces, independent and specific functions, separate and different plant species, permanent plant elements, specific planting design, distinct management and maintenance operations, and its distinguishable environmental design. The landscape identity of the utilitarian agriculture in Persian gardens consists of cultural identity, climate identity, and contextual identity. Furthermore, Persian gardens demonstrate the hierarchical access to productive greenery and edible yields which the accessibility policies consist of the range of full physical access to the complete interruption visual continuity. Interestingly, the access management to the edibles is conducted through spatial planning and creative environmental design.

In conclusion, the results of this study show the significance of historical green spaces by introducing the criteria of agricultural landscape planning and design. Specifying this point of view in which designing the agricultural landscape and urban agricultural phenomena is not only using the fruitful green elements, but rather the landscape personality, landscape identity, and landscape accessibility composes the backbone of planning and designing the productive landscape structure.

Table 16. Analysis of the Persian garden plant system from the viewpoint of the integrative fruitful-decorative landscape

Distinctive features of edible landscape in Persian garden	Personality of Edible Landscape	Plots and planting spaces	Independent			
			Large			
			Continues			
			Permanent			
		Independent and distinguishable function	Visual function			
			Operating function			
			Spatial function			
			Edible-economical			
			Recreational function			
		Particular plant species				
					Permanent plant elements	
					Particular planting design	
					Particular management procedure	
	Specific environmental design	Walkways				
		Contact with water				
		Planting design				
		Contact with mansion				
	Identity of Edible Landscape		Agricultural treatises		Nutritional culture	
			Culture of society			Hospitality
						Culture of production, contentment and frugality
						Ritual devotion
		Cultural identity	Religious and ritual culture		Culture of beneficence	
					Holy Quran and Islamic narratives (Hadith)	
					Resistant plant species	
		Clime identity	Adaptation with climate and water shortage		high value economic plants	
					utilization of sun	
					infiltration of rainwater into the ground	
Accessibility the Edible Landscape		hierarchical access to edibles				
					planning the accessibility	
		Access management by space planning, environmental design	separation the agricultural from non- agricultural spaces			
	separation the productive space of the main axis					
	Classification the routes and paths					
	Layered decorative plants					

## Chapter 6 : Principles of Integration the Agriculture and Pleasure Greeneries in Persian Garden<sup>5</sup>

Persian garden is an outstanding type of garden, resulting from the ingenious mix of natural elements and manmade components. It also integrates significant achievements in Persian culture and symbolic meanings into a refined and complex artistic manifestation. ICOMOS considers that the Persian Garden, as documented over the course of more than two millennia, has developed alongside the evolution of Persian society whilst always adhering to the early geometric model. Thus, the Persian gardens may be considered true cultural landscapes in that they reflect an evolutionary process in terms of form and composition (<http://whc.unesco.org/en/list/1372>).

The most important components of the Persian garden model are *garden elements* (water supply and circulation systems, walls, design, use of plants, use of geometry and symmetry); *relationship with the surrounding environment*; and *cultural associations*.

These components are described in the treatise on agriculture, written by *Heravi* in 18<sup>th</sup> century. The scarcity of water has stimulated the inventiveness of Persian garden builders to develop advanced systems and technologies to collect and use water and exploit the properties of vegetation types to create a micro- environment favorable to the self-sustenance of the garden and to human delight. One aspect of these gardens which has less yet been considered is principles of integration of the agricultural and pleasure greeneries in garden design system.

This chapter surveys the historical gardens of Iran to discover and introduce the principles of integration of the fruitful and ornamental plant elements in the structure of the historical green spaces. The aim, in addition to a deeper understanding of the historical patterns of landscape architecture, is to introduce indigenous and local principles so the landscape architects and environmental designers have a foundation on which to base their design of the urban agricultural landscape.

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<sup>5</sup> A summary of this chapter has been published in the proceedings of **6 International Conference on Landscape and Urban Horticulture** (Athens, Greece). Consequently, a four-page paper will be published in *Acta Horticulture Journal*.

According to this study the Iranian model of integration is multidimensional which all aspects should be considered. One aspect of integration includes the landscape architectural principles of integrating the decorative and productive elements. The second aspect refers to the characteristics of the productive landscape.

In fact, one of the achievements of this research which is based on both the library studies and the field surveys on the Persian gardens is the recognition of two aspects of integration; architectural integration, and the characteristics of the integrative landscape. Thus, the hardware aspect considers the physical-spatial-visual arrangement of the productive and ornamental elements together. Software aspects focuses on the characteristics and quality of the fruitful elements that are supposed to be integrated into the green spaces. In fact, one of the achievements of this research which is based on the field surveys on the selected Persian gardens is the recognition of two aspects of that integration:

- ***The architectural dimension of the integration of the decorative and productive:***
  - Physical separation,
  - Visual combination,
  - Spatial continuity,
  - Hierarchical accessibility
- ***The characteristics of integrated elements:***
  - Landscape personality,
  - Landscape identity

## **The architectural dimension of the integration the decorative and productive greeneries**

### **The principle of separation (physical separation)**

This principle tells that the physical space of planting and raising the two types of green systems which includes both ornamental and agricultural must be separated from each other, and how their physical specific area should be determined.



The Persian garden structure is based on this principle meaning that the agricultural green system and its production, economic, utilitarian, ecological, and justice seeking functions should be separated from the pleasure plant system which has been designed to adjust to environmental conditions as well as providing outdoor recreational resources. In this way the agricultural green system strengthens the indigenous culture and proper nutrition.

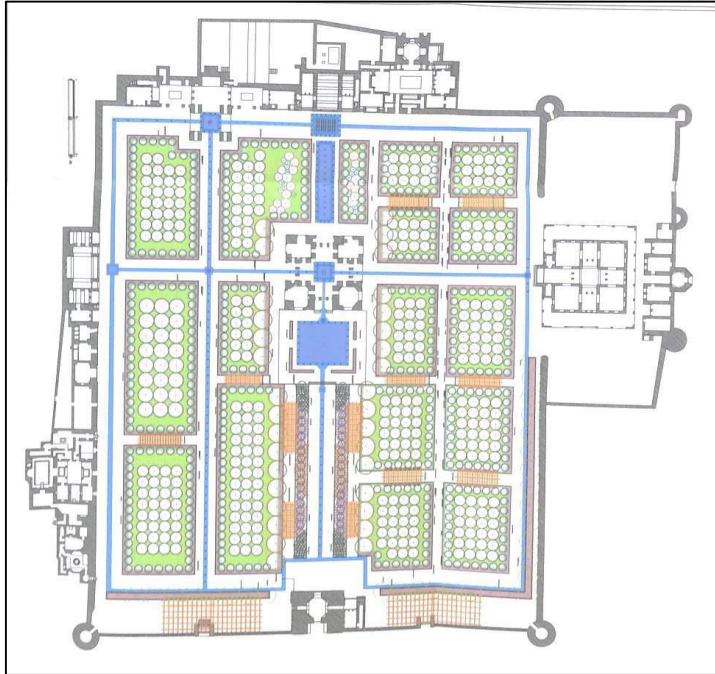
This separation means the physical planting areas are detached, and make up the independent structure of plant systems.

- Separation the production space of recreation space
- Separation the agricultural greenery of decorative greenery

This principle goes beyond reviving the Persian gardening principles, and out of respect to the Persian garden applies some technical reasons which are important in urban agricultural landscape design (subsequent figures).

### **Agricultural operation**

The physical separation of the agricultural landscape of the ornamentals makes the planting order easier, the planting direction, planting density, as well as the agricultural operations include planting, and maintaining and harvesting are more readily available. In fact, the areas under the landscape management divides itself based on the production or recreation application. Also, over time the inherent dynamics of the agricultural landscape is more dependent on human management in comparison to the non-agricultural plant systems. This causes the application of a kind of spatial planning and design which boosts the real agricultural phenomena. Therefore, the separation can make the agricultural operation more affordable and easier.



*Figure 42. Independent, permanent, large and continues planting spaces in the length and width of the garden devoting to fruit trees under the geometrical planting, demonstrates the personality of the Fin World Heritage garden in Iran.*

## **Landscape management**

Visitors to the public green spaces can influence the way the gardens are managed resulting in the spatial separation of edible and non-edible landscapes which in turn led to the optimization and improved productivity of consumed resources.

The physical-spatial combination of the productive and decorative spaces together causes problems for the landscape management, especially when the agricultural fields are not prepared for the public presence or in some months during special agricultural operations such as combating to the pests. It should also be mentioned that in Iranian gardening traditions, the separation between the utilitarian agriculture and pleasure gardening, even the fruit plots had been devoted to the planting of similar fruit trees due to their similarities in management and maintenance which makes the gardening operation more applicable, affordable, and even optimized.

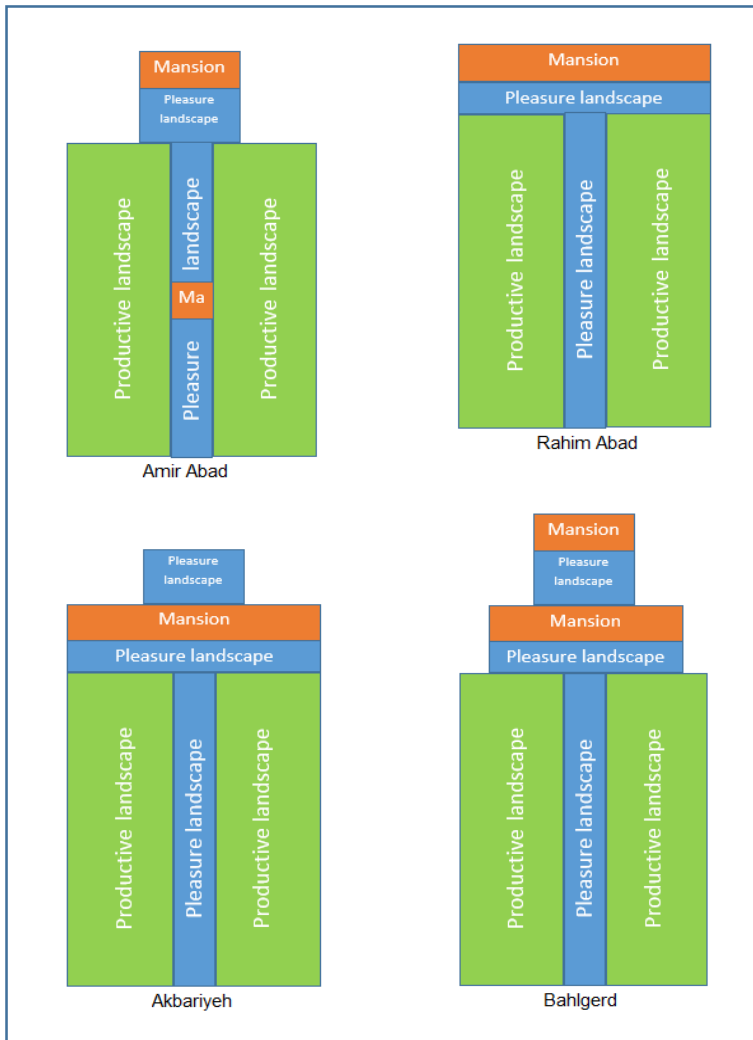
## **Assignment to people and companies**

The physical separation between the agricultural plant system and the ornamental causes the differences in the plan, maps, perimeter, density, and so on, and this will help the contractor who want to rent the agricultural fields of the municipalities or every other organization in charge.

Whether the contractor rents or manages the fruitful or ornamental sections separately or both together, or oversees the construction or management, the performance of the operational assignments will be helped due to the separation of the two spheres.

### **Strengthen the character and identity of landscape**

The physical separation strengthens the personality and identity of the productive green spaces. Contrary to the mixing of plants, filling the blank spaces by the fruit trees, and a nonsystematic approach to the integration of the edible plant system into the urban open and green spaces does not lead to the structural and principal integration, does not reinforce the landscape personality and landscape identity, and cannot be an appropriate indication of the continuity the cultural landscape of Persian garden in Iranian modern urban life.



*Figure 43. Separation the production space from the recreation space as a principles of integration the agricultural and pleasure greeneries in Persian garden*

## **Principle of visual-aesthetics composition (principle of composition)**

One of the other principles of integration based on the Iranian gardening is the principle of the visual-aesthetic composition. In fact, one of the wonders in Persian gardens is the physical separation of the two edible and nonedible plant systems, and at the same time composing the visual-pictorial aspect of these two plant system from the viewpoint of spectators which illustrate the integrative identity of the landscape. But these composed sceneries cannot be seen from all positions in the garden, rather the determined viewing angles has been defined for the visitor who is walking through the agricultural fields and looking toward the main axis direction. So, the spectators who enter into the agricultural plots, or pass the marginal path beside the wall of the garden, can look into the green scenery consisting of the edible plants in forefront and nonedible plants in background (subsequent figures).

The important items which have a role in the visual composition of edible-nonedible plants are as the follows:

### **The importance of the viewing angle**

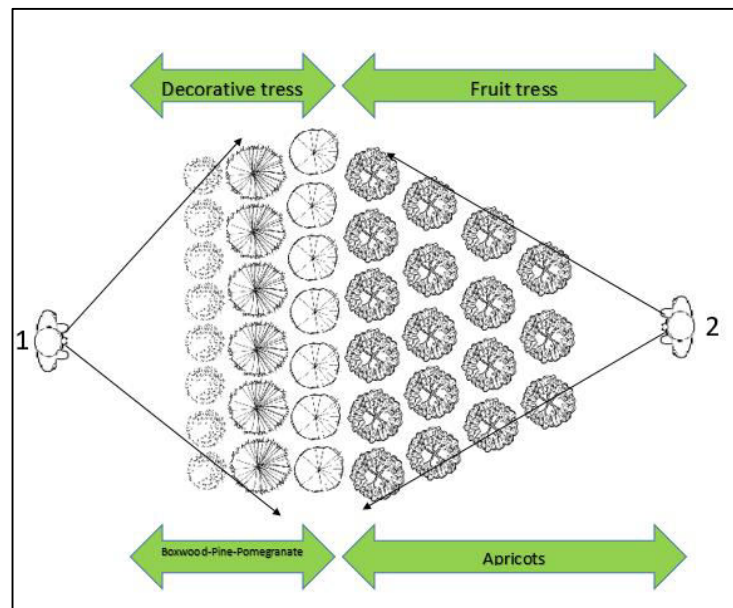
Due to the height differences between the fruit and structural trees, the garden order, systems, and the plant layers, means that the viewing angle becomes an important part in spectator positioning. So they can fully appreciate the composition of the garden.

Therefore, a significant criteria in the future of the systematic presence and integration of edibles into the ornamental section of the parks or any other urban green and open spaces is the consideration of the viewing angles. This should highlight the possibilities of the viewers' perception from these viewing angles. The other aspect of this principle is the conservation work during the years by the gardening and maintenance operations.

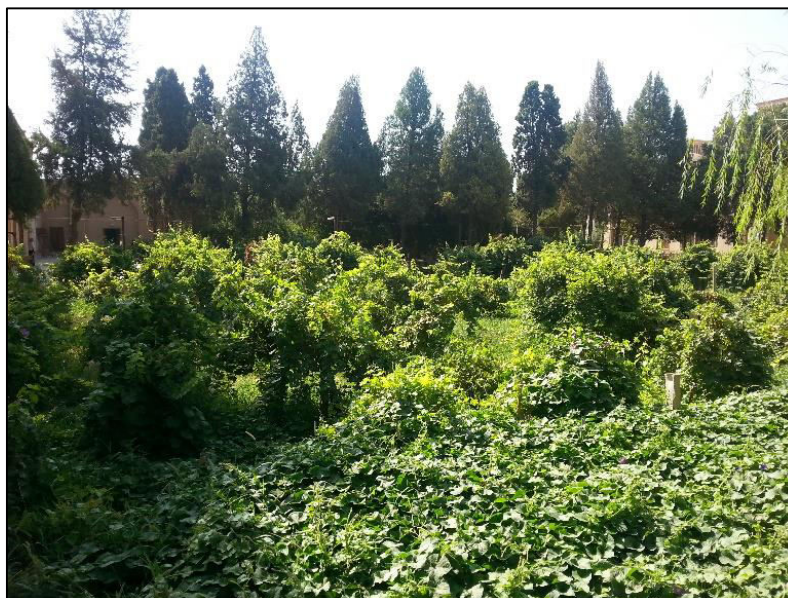
### **Importance of the viewing distance**

Owning to the fact that the Persian gardens are generally large in length and width, the visitors who stand in the agricultural area have a balanced view of the complete garden, including the fruit trees in the foreground and the structural elements and ornamental in the background. Those integrative scenes in terms of both height and horizontal direction can be seen, and thus in open

spaces that are smaller, the selection of lower height fruit and ornamental plant elements must be considered.



*Figure 44. While the person 1 (stands in the main axis) enjoys from viewing the structural plants which interrupts the visual continuity between the viewer and fruit trees, the person 2 pleasures from viewing the multi-storied planting design consists of fruit trees in foreground and tall ornamental trees in background, beyond being fed by the edibles.*



*Figure 45. The visual composition of the fructiferous with the ornamental green elements in Persian gardens opens a new window which is the illustrative approach in to urban agriculture; Dolat Abad garden*



## The importance of aesthetics

The visual composition of the fruitful plants with the lower height and high structural-ornamental elements in combination with their visual effects and differences (the seasonal changes of the edible plants in contrast to the constant picture of the non-edibles during the year). This demonstrates the aesthetic significance of the agricultural-ornamental composition and its role in the promotion of the aesthetic content of the built environment as well as showing the designers knowledge and thought in the arrangement of the plants.

Thus, the Iranian tradition of spatial planning and design beyond the physical and spatial separation of the agricultural areas from the recreational spots and corridors, provides angles and opportunities for observing the beauty of the integrative image of the two spaces in order to understand and realize the multiple functions of the greenery and built environment (following figure).



*Figure 46. Illustrative approach into urban agriculture due to the visual-aesthetic composition the vines in foreground with the cypress trees as well as the architectural monument in background; Dolat Abad World Heritage Cultural Landscape*

## **The constant and variable principles**

In comparison to the softwood and conifer plants with their consistent appearance, agricultural and fruit plants reflect the changing seasons in their foliage. The contrast between the structural conifers and the more decorative fruit plants provide a pleasing visual display, particularly in the winter months.

## **The shape and background principle**

In Persian gardens the visitor who stands in the middle of the main axis of the Rahim Abad garden has a 180 degree viewpoint. This also applies when they stand in the agricultural plots with a view to the main axis. The visitor able to see the complete composition of the garden including the fruitful and ornamental trees. The ornamental elements form a contrasting backdrop to the fruit trees because of their dark colors and height, allowing the shape of lighter and shorter fruit trees to become more obvious.

This composition tells the story of the facts. The decorative elements provide a beneficial foundation from which the human can enjoy the contrasting elements of the fruit trees. By highlighting the backgrounds and framework of the shapes of the decorative elements the preparation of blank plots can be filled by planting many fruit trees.

## **The multi-layered planting design**

For many Persian gardens, one of the opportunities in the visual composition of the agricultural-ornamental plants is the multi-storied plantings which illustrate the integrative identity of the landscape. The executive detail of this significant principle is to plant the edible plants in the foreground of the integration perspective, from the lowest height in front to the highest in the background. This allows the spectator to view the garden from the lowest level, the vegetables moving up towards the edible shrubs, the short fruit trees, and the taller fruit trees and eventually drawing the eye to the background of the structural and evergreen trees (subsequent figures).

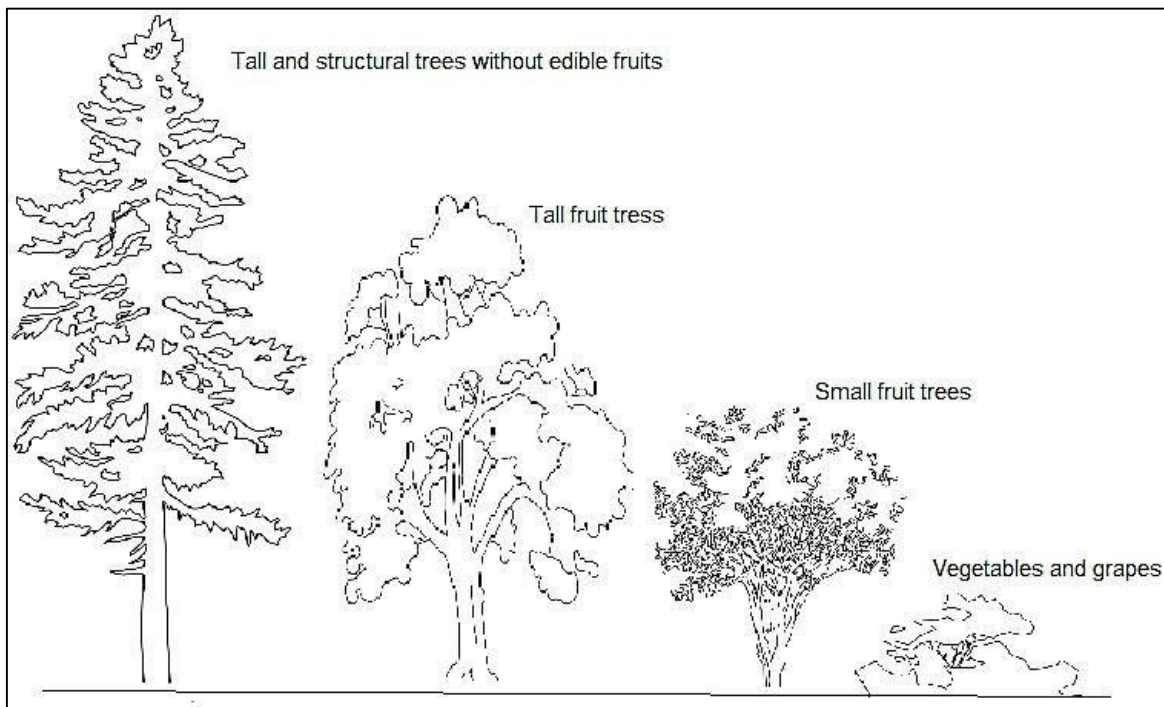


**Visual Composition**

**Foreground:** Pistachio  
(Utilitarian - Fructiferous)

**Background:** Cedar tree  
(Pleasure - Structural)

*Figure 47. Contrast the form and color between structural cedar trees in the background and pistachio trees in the foreground demonstrates the Persian version of edible landscaping*



*Figure 48. Multi-storied planting consists of fructiferous and non-fructiferous green elements, illustrates the integrative identity of the landscape in Persian gardens, beyond performing the functional, visual, and structural affairs*





*Figure 49. Visual composition of multi-storied plant elements in Amir Abad historical garden, Birjand*



*Figure 50. Illustration of the visual-aesthetics composition the fruit-bearing and not-fruit-bearing trees in Amir Abad historical garden, Birjand, Iran*



**Visual Composition**

**Foreground:** Pistachio  
(Utilitarian - Fructiferous)

**Background:** Pine tree  
(Pleasure - Structural)

*Figure 51. Illustration of the visual-aesthetics composition the fruit-bearing and not-fruit-bearing trees in Amir Abad historical garden, Birjand, Iran*

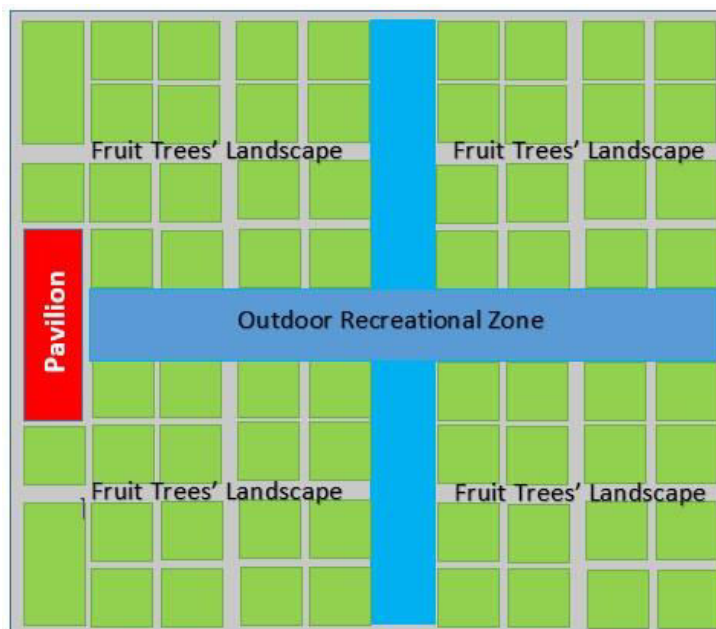
**Principle of continuity (continuation of the physical separation and visual composition in length and width of the garden)**

The principle of continuity points out the continuity and presence of fructiferous plants in the length and width of the garden, and therefore tells of the application of the two previously mentioned principles must not be limited to certain spots or islands in the garden, rather the integrative landscape of Persian gardens consists of fruitful and structural plants filling the space of the garden, both longitudinal and latitudinal, and thus follows the principle of continuity. Interestingly, beyond the concentration of continuity, the presence of edible plants shows the continuation of the two previous principles, and means on the one hand the continuation of the physical separation and on the other hand the continuation of the visual-aesthetics composition both in longitudinal and latitudinal aspect of the garden. The summary of this criteria means that while the planting areas of agricultural and ornamental plants should be differentiated, and while the people see the integrative picture of the composed productive-structural plants, those situations and principles must be continued in the landscape.

The subdivisions of this principle are the followings:

- Continuation the physical separation
- Continuation the visual composition
- Continuation the presence of fructiferous and ornamental plants in the garden

Comparing Persian gardens with historical gardens of other nations can complete the discussion. For example the presence of fruit trees in the Jardin du Luxembourg, or the Luxembourg Garden (in Paris) is limited to spots, and this is not continued. Moreover, despite the spatial separation, the visual combination is not seen.



*Figure 52. Spatial planning the garden space, continuing the plots of fruit trees across the garden, separation the recreational zone of agricultural fields as the principles of designing the Persian edible landscape in Golshan historical garden, Tabas, Iran.*

### **Access management and hierarchical accessibility (principle of accessibility)**

As mentioned previously and the subsequent figures shows, the accessibility to the productive green spaces and yields in Persian garden system is hierarchical. It means the accessibility to the fructiferous was planned in the spectrum of complete visual disruption to the complete physical access. Interested point is that the access management has been conducted through the spatial planning and environmental design, without utilizing the non-relevant material and methods:

- Separation the agricultural fields from the recreational zones
- segregation the agricultural fields from the main axes
- Grading the circulation paths and axes

- Multi-layered planting with the structural plants

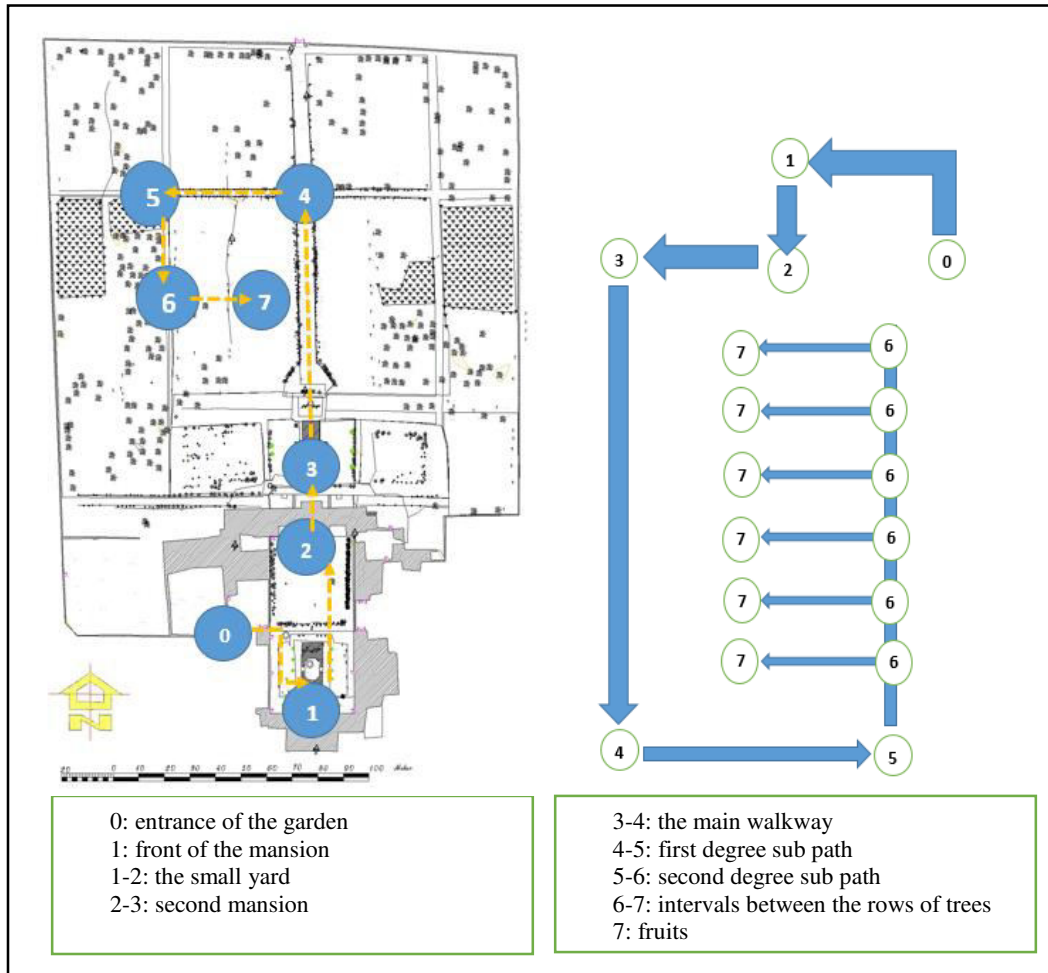


Figure 53. Hierarchical access to the edible landscape and fruits in Bahlgerd historical garden

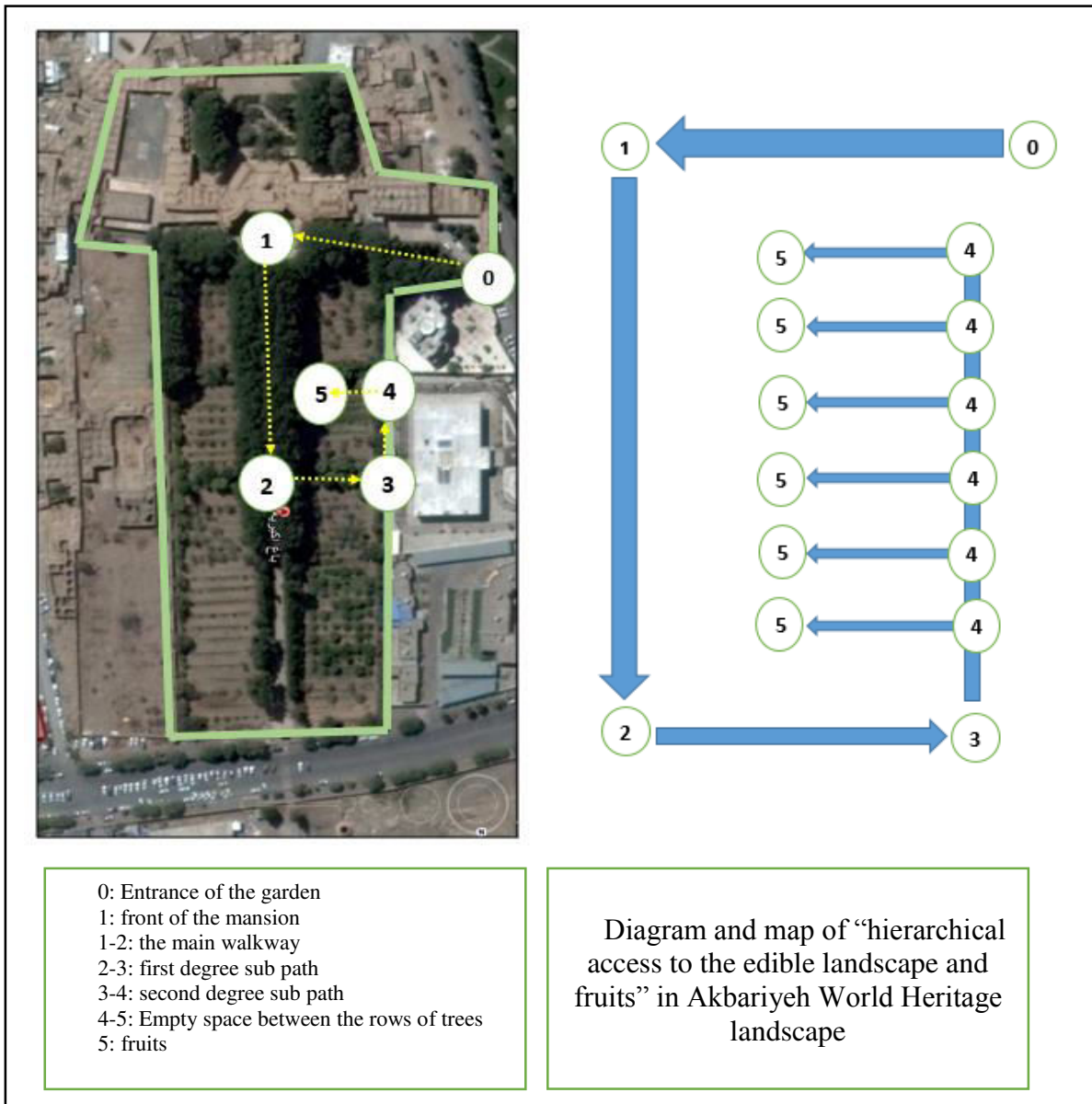


Figure 54. Hierarchical access to the edible landscape and fruits in Akbariyeh World Heritage garden



*Table 17. Planting design and the quality of the walkways in hierarchical access to the fruits in Akbariyeh World Heritage garden (refers to figure 54)*

The rout number	Introduction the routs	Planting design	Quality of paths
0-1	Entrance to the mansion	Only the ornamental and structural plants	Wide and paved paths
1-2	The main axis	Shady and tall plants	Paved main axis
2-3	1 <sup>st</sup> degree sub path	Mixed of fruit and non-fruit	Narrow and khaki
3-4	2 <sup>nd</sup> degree sub path	Mixed of fruit and non-fruit	Narrow and khaki
4-5	Interval the fruit trees	Only the fruit trees	Agricultural intervals

## The characteristics of integrated elements

### Principle of personality

The principle of personality directs into the quality of the integrated productive components. This personality is created from the following features which reinforce the presence of edible landscape as a significant part in the structure of the space.

- Planting space
  - Large
  - Independent
  - Continuous
  - Sustainable
- Plant species
  - Permanent
  - Distinctive
  - Multistoried

- Diverse
- Spatial-environmental design
  - Non-paved and narrow paths
  - No contact with visual pleasurable water
  - Planting on a grid / network geometry basis
  - Visual relationship with the ornamental green elements

### **Principle of identity**

This principle also directs into the nature of the integrated elements, not into the circumstances of integration. In fact, the four principles of separation, composition, continuation, and hierarchical accessibility mention the quality of integration and therefore can be named as the architectural principle of integration. On the other hand the two last principles of personality and identity insist on the nature and quality of the integrated elements.

From the viewpoint of landscape identity, one criteria of productive landscape concerning its integration into the urban and peri-urban green and open spaces must be its identity trait. The principle of the identity shows, that based on the identity rule of the agricultural landscape in Persian gardens and its root in local culture and religious believes, the new integrated productive landscape should have the local-national-and religious characteristics as a sign of the continuation of the Iranian- Islamic spirit in landscape (software principles), beyond regarding the architectural integration principles (hardware principles).

That identity can be created, regarded and reinforced via the following:

### **Cultural identity of productive landscape**

The design of the agricultural landscape including the written and traditional sources relating to the local, national and religious culture, should allow for the, modification the dietary culture and restoration the native-traditional cuisine, promotion the culture of hospitality, culture of kindness and charity, culture of devotion, and recreating Islam's emphasis on the Holy Quran's plants and Hadith's emphasis on useful plants and promote the health benefits of aromatherapy and pretreatment.



### **Climate identity of productive landscape**

Looking not only at the rules of ecology and the requirements for a resistant landscape, but also designing under the environmental conditions in terms of climate change and adaptation to environmental stresses and drought, it is advantageous to use the xeriscape design. This is a method specially designed for areas with difficult access to water. In order to deal with the harsh environmental conditions, only plants with appropriate requirements for the region are emphasized. Using ecological materials should also reduce the water infiltrating into the grounds and promote low-water irrigation systems.

Also species with high economic efficiency are planted, whereas sensitive species are located in a safe place, improving the efficiency of environmental conditions such as sun and rain, earth and water, and things like that.

### **Contextual identity of productive landscape**

Another important characteristic of agricultural landscape as an additional component in the development of green and open spaces, is considering the relationship of edible landscape and its geographical areas. In addition to the technical standards for architectural integration of fruitful and decorative elements and the integration of production and recreation, it is important to preserve the identity of agricultural production and natural talents in production- recreational planning and design.

South Khorasan in Iran is the hub of growing and producing the strategic agricultural products like barberry, saffron, jujube and pomegranate. The geographical conditions are very beneficial for various medicinal herbs, but the urban landscape authority has no concern to continue that mentioned identity in the development of the urban green spaces. In fact, no tourist or traveler in the areas of green open spaces in Birjand city as the capital of the barberry, saffron and jujube can realize its geo-agricultural identity. On the other hand, in the courtyard houses you can see the identity of the affiliation and continuity. Therefore, based on the rules of Persian gardening the attention to the underlying identity should lead to the re-creation and restoration of the natural-agricultural-production capabilities of the region and geographical context in edible landscape.

## Discussion

Urban agriculture is promoted as a resilience-enhancing strategy by the FAO, World Bank, European Union, World Meteorological Organization, World Health Organization (WHO), and U.S. Department of Agriculture (Clark & Nicholas, 2013). There is a variety in urban agricultural typologies that can be selected and developed based on the local opportunities and constraints. The question for Iranian cities and landscape would be about the appropriateness of Persian garden structure and its integrative landscape in development the urban agriculture.

While ‘planting food trees within local parks and other public urban green areas is starting to gain in popularity as a strategy to enhance the sustainable development of cities’ (LafontaineMessier, Gélinasb, & Olivier, 2016: 197), the lack of having a toolkit for Iranian landscape designers may makes them confused about adaptability of these new trends to the Iran’s conditions. But discovering the principles of integration the agriculture and recreation in Persian gardens which is the main achievement of the field surveys on several historical gardens which are located in different provinces in Iran, proved that the Persian historical gardens are appropriate spaces for development the urban agriculture in Iranian cities.

Nowadays, many of Persian gardens are being regarded historical monuments, tourist attraction sites, and in some cases educational centers. In private historical gardens, the agricultural activities and economic viability are more important than the public historical gardens. Actually, the agricultural activities in public gardens are more demonstrative agriculture, and therefore, the importance of the historical structure of incorporating the production and leisure has been underestimated. People goes to historical gardens as a public site for sightseeing, contact with nature and historical greenery, and despite the availability of land and water, they have not yet been engaged with gardening productivity in urban gardens.

Generally speaking, the structure and design of Persian garden are appropriate for re-entering the urban gardening and urban agriculture into the Iranian cities. Beyond providing the space, land, water, healthy soil, safety and security, the Persian garden introduces a local style of landscape design for agriculture landscape typologies.

There are other studies that reinforce our assumption. Astonishingly, the integrative landscape of Persian garden demonstrates initial coordination with new urban agricultural typologies. One type can be food forestry. Clark & Nicholas (2013) have shown that ‘urban food forestry can be a valuable strategy to address multiple sustainability challenges (e.g., food security, climate change, and poverty), to contribute to health through affordable increasing public consumption of nutrient-dense foods to combat hunger and obesity, and that it can be used to promote sustainable urban development through providing ecosystem services’ (1666). Thus, maximizing urban historical garden contributions to sustainable development can be promoted through multifunctionality, i.e., redefining landscapes to simultaneously and efficiently integrate multiple ecosystem services, and as we discussed in this chapter, the structure of Persian garden is appropriate for this kind of multifunctionality.

Additionally, the planting structure of Persian garden which consists of woody perennial plants can be a concept for the future urban food forestry, as Clark & Nicholas (2013) shows that the intentional and strategic use of woody perennial food-producing species in urban edible landscapes can improve the sustainability and resilience of urban communities. Iranian gardens also included plant heights to aid in multi-story design which is a specific technique to be maximized the ecosystem services.

Garden-parks is one of the triple typologies which have been defined by landscape architects and planners in Rosario, Argentina, to be part of the productive green structure. Garden-parks are larger public green areas in which recreational, productive, educational, and commercial activities are developed. Designers should integrate areas for leisure with areas for the production of vegetables, fruits, medicinal and ornamental plants (Dubbeling, Bracalenti, & Lagorio, 2009). Fortunately and as we showed in this chapter, the Persian garden has those mentioned characteristics, and therefore, can be a model for Iranian landscape architects and planners for development the new generations of garden-parks based on historical garden design.

On the other hand, there are many typologies of urban agriculture such as ‘community orchard,’ ‘urban orchard,’ ‘urban fruit trees,’ ‘city fruit trees,’ ‘urban food forest,’ ‘public orchard,’ ‘edible park,’ and ‘fruit tree project’ that the Persian garden can be accounted as a space for both the implementation of the above-mentioned edible landscapes, or as concept and model for the spatial-structural design, which can be specifically interesting for urban planners and other municipal

employees, landscape architects, landscape ecologists, and organization representatives and volunteers which can play an important role in determining appropriate implementation strategies to maximize benefit to urban citizens and target high-risk groups.

Interestingly, as the recent consideration that exclude sidewalk strips from the publicly accessible open space, as these sites may be unsuitable for public food trees due to falling fruit (Heimlich, Sydnor, Bumgardner, & O'Brien, 2008; Raupp, Cumming, & Raupp, 2006) in Persian garden the fruit trees were not being planted alongside the main walkways. In fact, the structural trees like pines, cypresses, and plane trees which are not bearing fruits were being planted beside the axis.

While in Persian garden the agriculture and pleasure green spaces have been physically separated, the visual scenery of these two types of greenery has been composed of the viewpoint of the spectator who stands in the agricultural fields. Thus, the formal landscaping has the visual and functional application in the Iranian edible landscaping. Interestingly, it has been shown by Morckel (2015) that the formal landscaping, non-edible plants for decoration and artwork are also important in edible landscaping. In fact, the urban agriculture landscape should aesthetically be experienced pleasant (Hale et al., 2011). Correspondingly, the Persian garden is the integrative landscape consist of production and pleasure zones which meets the multi-aspects of open space requirements.

Furthermore, the structure of urban agriculture landscape should be provided to accommodate the multiuse programming, including non-gardening programs, diversity, and opportunities for artistic expression (Napawan, 2014). Owing to the fact that the historical garden is multifunctional landscape, the structure and space of the historical agriculture landscape is ready for re-entering the new gardening programming, non-gardening activities, and opportunities for artistic expression. Because of having the tangible architectural monuments, mansion, and historical furniture, the historical garden is one of the best sites for development, education, extension, and implementation the urban agriculture. Nowadays, many of historical gardens in Iran are being regarded as the educational centers, art education, agriculture education, and therefore, the structure, space and location are adapted for the multi-usability approach.

While public spaces benefit from accessibility, production landscapes benefit from perimeter fencing to deter theft (Napawan, 2014). The accessibility to the agricultural fields of Persian garden has been limited by the wall as one of the structural elements of the garden. Beyond the walls and inside the garden, as mentioned in chapter four and also in this chapter, there is a policy of hierarchical access to the agricultural products in order to limit physical access to the fruits and other yields.

As we discussed the principle of separation the agriculture space from the recreation, leisure and main axis spaces, Napawan (2014) emphasizes on separating production and public space functions as a principle for designing the production places and urban farms as public space. She also tells about the importance of the central meeting spot in public edible landscape which promotes use by many and diverse users. Correspondingly, Persian garden has some main spots such as mansion, forefront of the main building, intersection of two axes, space of water features, and the main wide walkway in which the central meeting spot has been met.

Lastly, we should not forget that the Persian gardens as the appropriate space and structure for development the edible landscape has been located inside or on the periphery of cities, which initially this proximity offers opportunities for new business and distribution models that take advantage of growing trends in civic agriculture, local food movements, and agritourism.

## **Interim conclusion**

In this chapter we surveyed the historical gardens of Iran to discover and introduce the principles of integration the fruitful and ornamental plant elements in the structure of the historical green spaces. Concerning the fact that the Persian gardens can have dual or multiple functions as sources of income and pleasure, introduces them as a reliable spatial-physical reference for discovering the criteria of designing the multiple-functioned landscapes and open spaces. The aim, in addition to a deeper understanding of the historical patterns of landscape architecture, is to introduce indigenous and local principles so the landscape architects and environmental designers have a foundation on which to base their design of the urban agriculture landscape. There are ongoing projects in the fields of edible public area, urban orchard, urban food forestry, community orchard, urban fruit trees, city fruit trees, edible park, and fruiting walls (Clark & Nicholas, 2013; Lafontaine-Messier, Gélinasb, & Olivier, 2016) in which the role of practical implementation of

criteria which are retrieved from the historical garden landscape multifunctionality is vital. According to this study which is based on the field surveys on the Persian gardens, the landscape architectural principles of integrating the decorative and productive elements have been recognized. In fact, the hardware aspect considers the physical-spatial-visual arrangement of the productive and ornamental elements together. The landscape architectural principles of integration based on the Persian garden are these: principle of separation (the separation of productive space and recreational zone from each other which means the decorative landscaping and agricultural greenery should be physically separated from each other), principle of integration (the visual aesthetic combination of two types of plant system in the eye of the spectator, and emphasizes on the integrative identity of the garden), principle of continuity (tells the two previous principles should be continued in the longitude and latitude of the space and their application should not be limited to some spots), and principle of access management (which takes into consideration that there are some access strategies to the agricultural fields and fruits).

The other achievement in this chapter is two fundamental characteristics of the Persian edible landscaping were introduced, which can be the characters of the future urban agriculture landscapes. In fact, the author tries to fill the significant gap in the introduction the principle of designing the edible landscape for landscape architecture as well as environmental design engineers. As mentioned previously, these other two principles are landscape personality and landscape identity which have been explained in chapter five.

Having a toolkit of principles of integration the agriculture landscape into the open spaces development can be a significant challenge for landscape designers. This study showed that the historical landscapes and gardens can provide the local and traditional criteria of planning and design the integrative landscape consisting of edible and non-edible plants. At first, the agriculture and pleasure zones must physically be separated, but composing their visual appearances will promote the aesthetics of the green scenery. Thus, the illustrative approach into urban agriculture landscape should not be underestimated. The third aspect is the importance of continuity the physical separation and visual composition across the land, and not limiting their application into some spots. At lost but not the least, the accessibility rule tells about the hierarchical access to the edibles by access management the visitors through application the environmental design innovations.

Table 18. The principles of Persian version of designing the edible-integrative landscape

<b>Physical separation</b>	Separation the production space of recreation space	- Agricultural operation - Landscape management - Assignment to people and companies - Strengthen the character and identity of landscape
	Separation the agricultural greenery of decorative greenery	
<b>Visual composition</b>	The importance of viewing angle	
	The importance of viewing distance	
	The importance of aesthetics	
	The constant and variable principle	
	The shape and background principle	
	The multi-layered planting design	
<b>Continuity</b>	Continuation the physical separation	
	Continuation the visual composition	
	Continuation the presence of edible and inedible plants	
<b>Access management</b>	The hierarchical accessibility to the productive greenery	
	Planning the accessibility in spectrum of complete physical access to complete visual disruption	
	Access management through the spatial planning, environmental design	Separation the agricultural fields from the recreational zones Separation the agricultural fields from the main axis of the garden Grading the connection paths and axes Multi-layered planting the structural plants
<b>Landscape personality</b>	Planting space	Large
		Independent
		Continuous
		Sustainable
	Plant species	Permanent
		Different
		Multistoried
		Diverse
	Spatial-environmental design	Paths
		Water
		Planting geometry
		Relationship with the ornamental landscape
<b>Landscape identity</b>	Cultural identity of productive landscape	
	Climate identity of productive landscape	
	Contextual identity of productive landscape	



## **Chapter 7 : Appropriateness the Persian Garden's Design, Structure, and Elements for Development the Urban Agriculture**

Until now, we found that the Persian garden system has the special characteristics from the viewpoint of agricultural landscape. In chapter four we discussed the various environmental policies of the accessibility to the edible landscape. In addition we spoke about the distinctive features of productive landscape, and the architectural principles of designing the integrative landscape in Persian gardens in chapter five and six, respectively. Until now we have not compared the structure, design, and heritages of Persian gardens with the new achievements of criteria of designing the urban agriculture (UA) landscapes. In fact, one of the main question about the role of Persian garden in development the urban agriculture in Iranian cities and landscape would be the assessment the spatial and structural design of that type of landscaping based on the criteria which have been derived from the multidisciplinary studies and researches which most of them have been conducted in Western countries. Therefore, in this chapter we will compare and assess the appropriateness the Persian garden's design, structure, and heritage for development the UA landscape.

### **The multidimensional aspects of designing the UA landscape**

Thirty years ago Steiner and Brooks (1986: 30) anticipated the potentiality of integration “the forward-looking agricultural and landscape architectural programs to provide synergistic leadership for the greater production of food, fiber, fuel, and building materials while also recognizing conservation, environmental quality, and improved human welfare.” Now, their expectancy is being fulfilled, and thus, designing, programming, and developing the UA landscape cannot be the expertise of merely the landscape architects, nor the agriculturalists. Urban agriculture are becoming increasingly more popular and significant components of the urban landscape of many cities.

Considering the multiple dimensions of UA a general typology introduced by Simon-Rojo et al. (2016) aimed at understanding the different forms of UA, which the following table shows different typologies of productive landscape in Europe.

Table 19. Typology of urban agriculture in Europe (drafted based on Simon-Rojo et al., 2016: 23)

Typology of Urban Agriculture Europe	Gardening Level			
	Urban Food Gardening	Individual production	Individual + Collective P.	Collective production
		Allotment Gardens	Squatter Gardens	Educational Gardens
				Community Gardens
		Family Gardens		Therapeutic Gardens
				Allotment Gardens
	Farming Level			
	Urban Farming	On-site Experience	On-site E. + Flows	Flows
		Leisure Farms	Cultural Heritage Farms	Local Food + Farms
		Educational Farms		
		Social Farms	Experimental Farms	Environmental Farms
		Therapeutic Farms		

Since the “landscape architects are trained to understand the necessary design considerations for providing a successful public space, but often lack the experience to fully account for the contextual and spatial conditions or resource needs specific to a production landscape” (Napawan, 2014: 40). As previous table shows the multifunctional and multidimensional typology of UA landscape, the landscape architectures require the multi- and interdisciplinary approach into deriving the criteria and principles of designing the urban productive landscape. A deep review the recently published scientific books and papers in the field of agriculture landscape reveals that there are at least three major circles which determine the rules of landscape planning and design. In fact, we can categorize the recent findings in the sphere of UA design in to these three groups:

- *Health considerations*
- *Social and cultural considerations*

➤ *Ecological considerations*

## **Health considerations in designing the UA landscapes**

Considering the possible health risks associated with urban horticulture, the three major sources of trace metal accumulation in urban crops are: use of contaminated soils for cultivation, crop irrigation with wastewater, and airborne pollution by traffic or industrial emissions (Säumel et al., 2012). One of the main consideration in this regard is the effect of the local traffic burden and the trace metal concentration in the edible biomass of different horticultural crops cultivated by gardeners in the inner cities, which directly determine the human health risk associated with consuming the products of urban horticulture.

The study concluded that air pollution in Varanasi (India) could negatively influence crop yield. The study of Agrawal, Singh, Rajput, Marshall, & Bell (2003) clearly shows that gaseous pollutants such as SO<sub>2</sub>, NO<sub>2</sub> and O<sub>3</sub> have detrimental effects of varying magnitude on wheat, mustard, mung and palak plants depending upon individual pollutant concentration in combination, plant species and season. Säumel et al. (2012) explored the health considerations of urban horticulture in high traffic areas within inner city neighborhoods in Berlin, Germany. They revealed “significant differences in trace metal concentrations depending on local traffic, crop species, planting style and building structures, but not on vegetable type. Higher overall traffic burden increased trace metal content in the biomass” (p.124). Fortunately, they discussed consequences for urban horticulture, risk assessment, and planting and monitoring guidelines for cultivation and consumption of crops.

There are some specific design guidelines to enhance the health of urban edibles (Säumel et al., 2012): the presence of barriers between cultivation site and roads strongly reduces trace metal content. Considering the traffic-related contamination of inner city crops, undertaking the cultivation at sites where buildings and large stands of vegetation has been established, the airborne pollutant influxes can be markedly reduced.

The study of von Hoffen & Säumel (2014) who explore the cadmium (Cd) and lead (Pb) content in nuts, berries, pome and stone fruits harvested within the inner city neighborhoods in Berlin, Germany, demonstrated that the Cd and Pb contents in fruits harvested from trees growing within

inner city neighborhoods were below the Europe standards for fruits, partially below values found in fruit samples from super- markets and were considerably lower in urban non-vegetable fruits than in urban vegetables. Based on their data, the consumption of urban fruits is not harmful to human health and fruit trees and shrubs can be considered more suitable for urban gardening in highly polluted areas compared to vegetables. They suggested that the site pollutions should be considered in garden concepts and guidelines by considering the minimum distance to roads, usage of barriers, and planting concepts.

Study of von Hoffen & Säumel (2014) revealed that barriers between planting site and road reduced Pb and Cd in the edible parts of fruit trees. They provides evidence for the development of planting concepts for urban gardens. “Hedges or walls minimize contamination effects, especially within high traffic areas. Nut trees can form the outer and pome and stone fruits the medium boundary of urban garden areas, whereas berries and vegetables should preferably be cultivated in the central area of urban gardens.” (p.238)

Moreover, regarding the soil health in UA landscaping, spatial zoning and segmentation would be a landscape design strategy to overcoming the contaminated soils. In the study of Wilschut, Theuws & Duchhart (2013) contaminated soils were divided into three categories:

- **Heavy polluted parcels** that must be transferred to another place to get clean,
- **Medium polluted parcels** which can be bioremediated on its site, and
- **Clean parcels** which do not need to remediation, and can be utilized for food production.

Therefore, considering to the health status of the soil and designing the project for getting back the cleanness to the soil, can be another design guidelines in productive landscape design. In fact, analysis of the site should be taken to consider potential risks to health products. Planting design solutions emphasized on the significance of barriers between sources of air pollution and plants. Consequently, regarding the site soil analysis, landscape architects can specify the contaminated soil to ornamental plants as well as devote the clean basis to the food products.

Mitchell et al. (2014) have discovered the other productive landscape design criteria based on the health consideration of the soils, such as gardening in raised beds, importing clean soil and compost (without elevated concentrations of Pb or other contaminants) for bed establishment, and

maintaining beds by frequently adding clean compost are helping to reduce the potential for gardening-related exposures to soil contaminants.

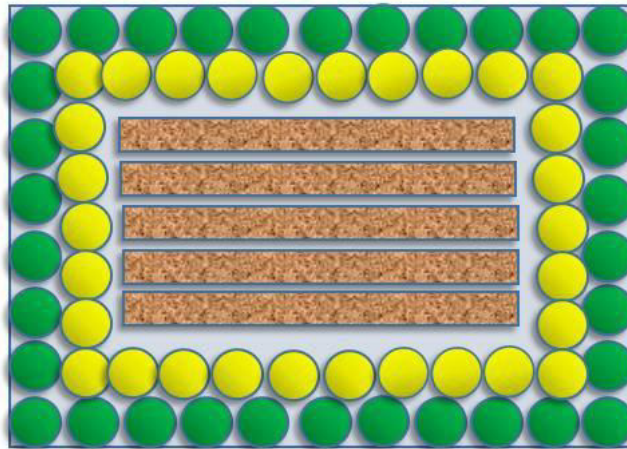


Figure 55. Planting design of urban gardens located in traffic areas based on health concerns (Green circle = nut trees; Yellow circles= pome and stone fruits; Long rectangles= berries and vegetables)

Table 20. Guidelines the UA landscape design based on the health consideration of the edibles

Guidelines	Design detail	Implementation
<b>Considering the distance to the roads</b>		
<b>Planting design</b>	Planting the nut trees in the outer border of urban garden	
	Planting the pome and stone fruits in the medium boundary	
	Cultivation the berries and vegetables in the central area of urban gardens	
<b>Usage of barriers between cultivation site and roads</b>	Buildings and walls	
	Hedges and large stands of vegetation	
<b>Soil concerns</b>	Heavy polluted	transfer to another place to get clean
		gardening in raised beds
		importing clean soil and compost
	Medium polluted: planting the ornamentals and not fruit bearing plants	
	Clean parcels: utilizing for food production	
	Maintaining beds by adding clean compost	

## **Socio-cultural criteria in productive landscape design**

UA projects provide opportunities to enhance community involvement, promote social interaction between ethnically and age diverse communities, provide a strategy for vacant property re- use, and act as catalyst for community development (Napawan, 2014). Thus, designing the urban productive landscape would be conducted based on the guidelines and criteria which have been derived from the social and cultural application of that specific eating places. Thibert (2012) argues that food provision and urban agriculture need to be better theorized as a planning strategy and integrated into comprehensive plans and frameworks. In fact, designing the urban agriculture greenery has the significant socio-cultural roles, and therefore, “landscape architects might begin to better understand how to adapt public landscapes into thriving social spaces that also produce food” (Napawan, 2014: p.40).

Morckel (2015) believes it would be helpful to know more about community gardens as a land use, particularly in terms of attractiveness, so that the benefits of the use can be maximized. She argues that any standards or guidelines should be relatively inexpensive to meet and simple enough to be implemented by residents who do not have design expertise. Furthermore, she mentions two creators of design guidelines for community garden spaces:

**Firstly: social roles and functions of the garden** (empowering the gardeners to do whatever they want)

**Secondly: attractiveness the green spaces view** (the esthetics of farm and community space). “The purpose of the guidelines is to achieve a balance between garden groups’ desires and the esthetic concerns of nearby residents and city staff.” (Morckel, 2015: 715)

## **Functional guidelines**

The application of functional criteria is “development of design guidelines that can be used to enhance the public space values of production landscapes. As well, the guidelines can be used by public space designers who are considering the integration of food production programming” (Napawan, 2014: 37). Due to the different typologies of urban farming, there can be introduced some specific and common design guidelines for each type of urban edible greenery development. For instance, the food forest which is a gardening technique or land management system, which

mimics a woodland ecosystem by substituting edible trees, shrubs, perennials and annuals. Urban forest garden inspires the community to gather together, grow their own food and rehabilitate their local ecosystem. Moreover, improving public health by regenerating the public land into an edible forest ecosystem, working to reduce agricultural climate impact, improving the local food security, providing educational opportunities, and providing the possibility to celebrate the growing food for the benefit of all species would be the multi aspects of this type of edible landscaping. Based on the food forest functions, there would be the guidelines of landscape architecture.

For example, the design of the Beacon Food Forest (seven-acre site) which is located in Seattle, WA provides opportunities for cultural exchange and understanding, as well as for education and recreation, and will cover the following items (<http://www.beaconfoodforest.org/>):

- Fruit and nut trees make up the upper level,
- berry shrubs, edible perennials and annuals make up the lower levels
- Combine the native habitat rehabilitation with edible forest gardening,
- an Edible Arboretum with fruits gathered from regions around the world,
- a Berry Patch for canning, gleaning and picking,
- a Nut Grove with trees providing shade and sustenance,
- a Community Garden using the p-patch model for families to grow their own food,
- a Gathering Plaza for celebration and education,
- a Kid's Area for education and play, and
- A Living Gateway to connect and serve as portals meander through the forest.

The findings of Milburn and Vail (2010) on the keys to community garden success included the following physical design considerations:

- Proximity to users and accessibility,

- physical characteristics that support growing (solar gain, access to water and soil),
- compact site (as opposed to long, linear sites),
- high visibility from the street and within the garden, and
- Inclusion of appropriate site elements for growing (including composting, storage, perimeter fencing, and bulletin/message board).

Moreover, Hou, Johnson, and Lawson's (2009) work on hybrid community garden and public space projects identifies several important physical conditions for successfully designing production landscapes as public space, including:

- ability for incremental change, adjustments, and improvements over time;
- sensitivity to existing context and user needs;
- multiuse programming, including non- gardening programs; and
- Diversity and opportunities for artistic expression.

Napawan (2014) by reviewing the literature specific to the development of UA projects, including communally- managed spaces has concluded the physical condition and spatial components into three predominant site criteria:

- **Site context**
  - Appropriate neighborhood context
  - Pedestrian or transit accessibility to site
- **Site perimeter**
  - Ease of site entry
  - Visual connectivity
- **Site layout and design**
  - Flexible layout
  - Accessibility within site
  - Site maintenance



- Flexible program opportunity
- Dual functions of urban farming and alternative recreational programming, but do so by separating production and public space functions
- Display opportunities for nesting food production and public space programming to varying degrees.
- A central meeting spot
- Gathering space on the site
- Hedgerow, raised planter beds

Moreover, Francis & Griffith (2011) to answer the question of how best to organize design features and spatial patterns of farmers' markets in public space and contribute to the structuring of a socially interactive and meaningful space, present four design principles for planning and designing the farmers' markets in public space:

- **Permanency of design:** the following landscape features can establish the market's garden permanency through design:
  - entry structures, bandstands, gazebos, fountains, market pavilions, mature groves of trees, socially interactive plazas, pedestrian-scaled lighting, and thematic gardens
- **Flexibility:** A resilient design must be adaptive and accommodating and should work with regional climate and allow the space to adapt to seasonal variation and fluctuations in market patronage
- **Wholeness:**
  - simultaneously distinguished from and reflective of the adjacent urban context
  - the importance of spatial consideration of the periphery of the market landscape
  - engaging the adjacent communities into design program
- **Social life:** Special design attention should be given to supporting socialization:
  - Coordinating the promenade and the market landscape with the sedentary spaces
  - More spontaneous public space

- Adequate seating of both the fixed and movable variety
- Accommodating the diversity of age, gender, and cultural background
- Integrating children's play and activity needs into the design
- Social programs
- participatory design process

### **Attractiveness guidelines**

To provide insight into what can be done to improve green spaces to make them more attractive community assets year round, the findings of (Morckel, 2015) reveals the presence of each of the following features would be beneficial and effective:

- a focal point (such as a gazebo or arch),
- fencing,
- plants arranged in rows,
- raised garden beds,
- formal landscaping (like walkways),
- trees,
- non-edible plants for decoration (besides trees), and
- Artwork.

Morckel (2015) explains that “a focal point such as a gazebo or an arch was a strong predictor of attractiveness scores. Consequently, policy makers and organizations that support community gardening can suggest that focal points be included in green spaces. Trees were a significant predictor of attractiveness in spring and summer, but not in winter and fall.” (p. 719). This result makes sense considering that many trees do not have leaves during the fall and winter seasons, and most fructiferous are deciduous trees, if more conifers had been included, trees may have been a significant predictor of attractiveness in winter and fall as well.

Table 21. Public urban productive landscape design criteria based on Socio-cultural consideration

	Guidelines	Design detail
Attractiveness	Focal point	gazebo or arch
	Fencing	
	Plants arranged in rows	
	Raised garden beds	
	Formal landscaping	walkways
	Integration the conifers	
	Non-edible plants for decoration	besides trees
	Artwork	
Functional guidelines	Site context	Appropriate neighborhood context Pedestrian or transit accessibility to site
	Site perimeter	Ease of site entry Visual connectivity
	Site layout and design	Flexible layout and program opportunities Accessibility within site Site maintenance Alternative recreational programming Separating production from public space functions A central meeting spot Gathering space on the site Hedgerow, raised planter beds
	Permanency of design	entry structures, bandstands, gazebos, fountains, market pavilions, mature groves of trees, socially interactive plazas, pedestrian-scaled lighting, and thematic gardens
	Flexibility	resilient design regional climate adapt to seasonal variation market patronage
	Wholeness	distinguished from urban context reflective of the adjacent urban context spatial consideration of the periphery landscape engaging the communities into design program
	Social life	More spontaneous public space Adequate seating Accommodating the diversity of age, gender, and cultural background Integrating children's play Social programs Participatory design process

## **Ecological criteria of productive landscape planning and design**

### **Value the native and local species in edible landscaping projects**

Native plants can be used to create sustainable landscapes. Most native plants are perennial and have extensive root systems that hold soil and slow runoff. Native plants have many positive characteristics. They are also self-sustaining, and they support wildlife including beneficial insects, pollinators, and native birds. Once established, these landscapes can be managed by using principles of Integrated Pest Management, which emphasize lower pesticide usage. These sustainable landscapes require less chemical treatment, reducing the amount of chemicals put into the environment which have non-targeted effects on the ecosystem, its plants, and its animals (Krischik, Reed and Willey, 2000).

One type of ecological productive landscaping is edible forest garden which is an edible ecosystem, a consciously designed community of mutually beneficial plants and animals intended for human food production. It provides more than just a variety of foods based on the details mentioning by Jack and Toensmeier (2005):

- **Perennials:** most plants regrow every year without replanting.
- **Polyculture:** many species grow together.
- **Multipurpose:** each plant contributes to the success of the whole by fulfilling many functions.
- **Provision:** food, fuel, fiber, fodder, fertilizer, and fun.

Permaculture compose the core idea of edible forest which its architecture are the three ethics which form the foundation for permaculture design: care for the earth, care for people, and fair share.

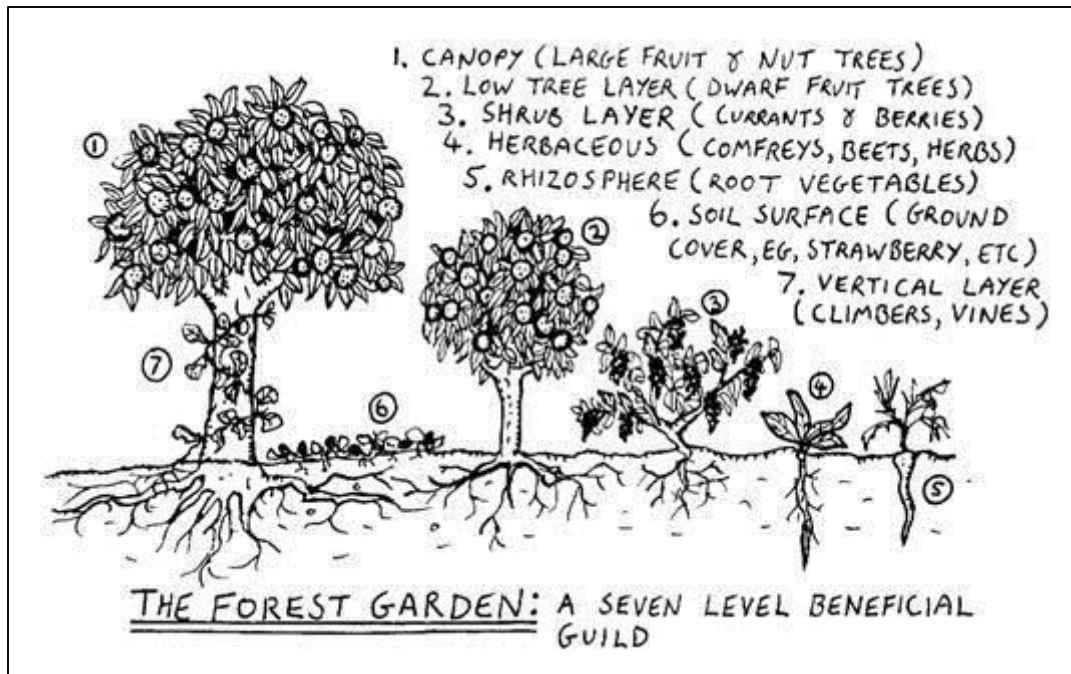


Figure 56. A schematic view into the architecture of permaculture edible landscaping

(<http://www.beaconfoodforest.org/permaculture/>)

Invasive species are among the main causes of biodiversity loss in the world and spreading invasive plants through ornamental use is a problem that should be avoided. The study of Moro, Westerkamp, & de Araújo (2014) focused on the importance of reviving the use of native trees in urban treescape and found that in urban landscape design based on a variety of educational, ecological, and edible production reasons the emphasis should be on using native trees and edible plants. They compared the ratio of native to exotic species in Fortaleza, Brazil, and found that the exotics were prevalent in both number of species and number of individuals. Only 14% of the native species of the vegetation were also represented in the treescape, and, in general, they comprehended only a few individuals. Moro et al. (2014) argue that the city's treescape should be re-evaluated in order to value native plants more. Native plants in the treescape could be used as an environmental education tool to publicize native biodiversity to citizens.

Therefore, the future edible landscaping projects should value native biodiversity and select from local ecosystems species to be introduced as productive-pleasure in order to avoid exotic invasive plants and improved ecological services and the contact of citizens with local biodiversity.

## **Role of traditional gardens in ecological edible landscaping**

Maintaining agricultural diversity is important for the conservation of rare species and for preserving underlying ecosystem processes on which smallholder farmers rely. On a wider scale, the study of Norfolk, Eichhorn, & Gilbert (2013) supports the view that smallholder farms and home gardens can be valuable tools in conservation, preserving local species and maintaining ecosystem functioning whilst playing a vital role in food production for the world's poorest people. This study shows that orchard gardens is the habitats of rare species is arid environment.

In spite of the forests were described as dense plantations of tall exotic trees which blocked out light and prevented the growth of desert shrubs, the agricultural gardens are run on the principles of agroforestry to allow light to reach the cultivated vegetables and herbs growing beneath them, allowing the growth of native desert shrubs with higher ecological value than agricultural weeds (Norfolk et al., 2013). Furthermore, the cultivation of the wide variety of vegetables, vines and trees brings additional functional richness, above and beyond that seen in the naturally occurring desert shrubs.

Creating new agriculture gardens and edible landscapes which have been created based on the traditional orchard criteria, has the potential to provide conservation benefits, particularly in the town and low desert where abundances and diversity of wild plants in the surrounding environment are lowest. Moreover, in the absence of shops and the limited accessibility to the town markets, especially in winter, edible places as well as traditional gardens have an important role as a complement for food supply, hosting a wide diversity of species and varieties for household consumption.

## **Appropriateness the Persian garden for development the UA landscape**

To how much the Persian garden structure, design, and heritage would spatially and physically suitable selection for development the urban agriculture landscapes? We spoke about the originality and significant role of Persian garden in previous chapters. If it will be proved that the historical gardens of Iran are appropriate sites for being programmed and accommodated the different typologies of productive landscape, two main outcomes will be expected:

- Introduction the spatial and environmental design of Persian garden as a model and reference for designing the new urban agriculture landscapes
- Re-programming the remnant historical gardens for accommodating the edible public greenery

### **Features existing in the garden**

The Persian garden designers have employed the whole available potentials to make the elements required for establishment the artificial ecological environment by using the techniques of soil fertilization, irrigation systems, adjustment of environmental elements such as making of shade, and plantations. The socio-environmental problems have however been resolved in such a way as the resulting artificial ecological landscape is a charming and pleasant environment for refreshment, beyond bearing fruits only. There are several elements in Persian gardens which would encourage people for being present at these sites. Shade, water, geometric layout, and architecture are the uppermost of determinant elements. In the Persian gardens the different component parts of water, planting, geometry and architecture drew all together into a satisfying and harmonious composition. This is what would make the design and structure of Persian gardens somehow compatible for urban agriculture accommodation. For instance, when the issue of water was being considered, it was not all about irrigation the agricultural fields; rather, aesthetic and ornamental goals needed to have been observed as well. Arrangements such as designing beautiful waterways, use of colors, tiles, and colorful paintings, fountains, and use of natural reflection of sky in water were made to meet such goals. Each and every part of the Persian garden as one whole phenomenon functions in such a way as to display the potentiality for creation the multifunctional space.

Features existing in Persian garden are divided into two groups of natural (soft landscaping) and artificial features (hard landscaping) which together shape the garden body. Artificial features are made of the general geometrical design of it in which natural features lay beside architectural ones. The latter consists of architectural spaces each having structures compatible with required functions and spaces. For example the mansion, wall, walkways, and entrance are the artificial spaces. Among natural features of the garden are trees, bushes and of course water which is the most important formative element of the garden. Accordingly, the relationship of components of

the Persian garden and urban agriculture development based on the guidelines mentioned in this chapter can be explained as follows.

### **The Main Pavilion of the Garden**

Regarding the importance of architectural features in garden structure, after entering the garden and passing a pleasant walkway amid which there is a beautiful water stream and structural tress like cedar tree lines alongside, the main building which serves as the focal point of main axes as well as the whole garden is located in heart of the garden. Generally, in opposite the main pavilion, there exists a pool or fountain. The Persian gardens' pavilions have been constructed in two stories in which the second floor has several corridors. The mansion can serve several significant functions in envisioning the urban agriculture inside the garden. Interestingly, the main pavilion as the focal point of the garden provides the spatial requisite for attractiveness, as well as serving as the central meeting spot and gathering space on the site.



*Figure 57. The main pavilion of Persian garden can serve as the focal point of the UA landscapes*





Figure 58. The main building of the Persian garden can serve functional and aesthetic application in future of UA landscape development

In *Pahlavanpur* garden, positioning of the mansion inside the garden arena is in such a way that is almost symmetrical in relation to both garden entrances. Moreover, passage of *Hosein Abad Qanat* from beneath the mansion has provided a lovely environment. Orientation and development of the garden somehow relates to the dominant regional wind too, so that the wind can easily circulate inside mansion structure. Mansion has been surrounded by trees because of its summer time usage and due to its relatively numerous openings, it is suitable for heat exchange.

In *Akbariyeh* garden, the structure called the ceremonial building has a particularly interesting façade compared to other structures. This two floored building has an entrance space consisted of two symmetrical stairways at its left and right sides .Moreover, wide porticos and terraces of this mansion in the second story make the observer the opportunity to walk around the buildings and to keep a simultaneous dominant view of the entire garden. This feature has increased its quality richness and the visual pleasure a sightseer gains in the complex. Midway through the main axis of the garden, at the end of this path and opposite the main pavilion, there exist water basins which not only highlight garden reflection in the water but also emphasize the key role of water in the formation of the garden.



Figure 59. Artworks on the tower and decorations on beneath the roof of summer palace in Pahlavanpur World Heritage Garden (NBPGO, 2011: 567)

Table 22. Role of hard-landscape elements of Persian garden in accommodating the UA landscape

	Guidelines	Role of architectural heritages in development the UA in Persian garden
<b>Attractiveness</b>	Focal point	Mansion and pavilion as the focal point
	Formal landscaping	Walkway in main axis
	Artworks	Traditional decorations of buildings, walkways, entrances, and outdoor furniture
<b>Functional guidelines</b>	Site perimeter	Ease of site entry because of distinguished entrance
	Site layout and design	Accessibility within site through the permanent circulation system Alternative recreational programming because of existence the architectural heritages and non-agricultural spaces Separating production from public space functions Pavilion as the central meeting spot Gathering space on the site around the pavilion
	Permanency of design	All the architectural features (pavilion, buildings, wall, entrance, walkways, canals, pools and gazebos) are permanent in Persian garden
	Flexibility	Considering the resilient design, regional climate, and adapt to seasonal variation in Iranian traditional architectural heritages
	Wholeness	distinguished from urban context because of historical environment of the gardens
	Social life	Seating facilities in garden notability the garden among the citizens as the valuable cultural heritages Providing the architectural spaces (indoor and outdoor) for participatory process in UA

## **Paths and circulation network**

Paths are an integral part of the order and geometry of the design. Paths provide wonderful opportunities for geometric patterns. Paths are formal, and accordance with the garden layout and the overall structure. Paths in Persian garden is designed based on the overall geometric and disciplined form of *chahar-bagh*.

The circulation system as the access network plays the important role in introducing the agricultural identity and capabilities of the urban historic gardens into the public visitors. “People will only develop an attachment to the landscape if they can see and use it in their private activities, their leisure, their daily commute, etc.” (Timpe et al., 2016: 131). The access network of Persian garden as previously explored in chapter four has been organized in a way that welcomes visitors without creating conflicts with the agricultural uses. Beyond the main axes, pre-existing agricultural road system provides the basic structure, which is adapted to a multifunctional use. Furthermore, it would be possible to marking special paths to guide the visitors, transforming the design of existing paths to adapt them to multifunctional uses, or inserting new connection in the existing circulation system.

## **Walls**

Wall is one of the indispensable features of the Persian garden, which its function is the marker of the boundaries of property and as a border between the outer and the inner area. Persian gardens areas isolated from their surroundings by boundary walls and planting. “Considering the extremely limited water sources, the area in which cultivation of plants is possible is marked and enclosed by walls, so as to make it distinguishable from the surroundings, and ready for a certain type of creation. As creation of a garden in such climate is facilitated with difficulty, and even preparation of fertile soil is not easy, it results in formation of one artificial ecological environment distinguishable from its surrounding” (NBPGO, 2011:58).

The walls as the garden’s enclosure has been constructed around the property in order to make the garden secure as well as providing an enclosed and geometrical space. High walls near the double longitudinal side axes, separate the garden from the surroundings. As mentioned in this chapter, usage of barriers between cultivation site and roads, such as buildings and walls can reduce the impact of pollution on the health situation of the edibles. Therefore, the Persian garden structure

by using the wall provide the possibility for producing the healthy fruits through urban gardening. Moreover, the wall system of Persian garden was reinforced by the hedges and large stands of vegetation which planted besides the marginal walkway passing beside the garden enclosure. The plant species of this marginal vegetation was normally selected of the structural plants that serves some inedible services. From the attractiveness viewpoint, fencing is an important element for demonstrating the urban agriculture more attractive. Thus, from this perspective the wall system of the historical garden have another important function, beyond preparing the production site more secure and safe, physically, spiritually, and healthily.



*Figure 60. Wall and huge vegetation system in Persian garden*

## The Entrance

The mere structure for entering into the garden space is entrance which its height is more than the wall of the garden, and due to its geometrical works and decorations catches the attention of the visitor. In some gardens like Fin, the two-storied entrance structure is one of the main architectural features, and in opposite the Pahlavanpur garden has simpler gate. In Fin, on the either sides of the entrance, subsidiary entries have been constructed for the passage of domesticated animals.



*Figure 61. Wall and entrance tower of Pahlavanpur garden (NBPGO, 2011: 568)*

Having the entry structures and ease of site entry are mentioned as the requisite characteristics of collective productive site. *Akbariyeh* World Heritage Garden has two entrances of which the one nearer to the square is regarded as its main gate because of providing fast access to the main walkway as well as easy car usage. That frontispiece has twice the height of garden walls and harmoniously proportioned. Additionally, its white coating makes it distinct from the mud brick wall of the garden. Despite not being in an axial alignment with the main pivot of the garden passing through the pavilion, but is an important structure because of its nearness to the pavilion and other vital service spaces of the garden. Also to reach the pavilion, the yard in which service spaces are located must be crossed. This yard is positioned vertically in relation with the longitudinal axis of complex of Pavilion and its annexed spaces; as a result it has a beautiful perspective of these structures as well as the area located in front of the pavilion.

## Water

Clark (2014: 87) describes: “The soul of the Eastern garden is centered on the running water which alone makes it other beauties possible ... There is no question that water is the supreme element in the Islamic garden, both on a physical and metaphysical level.” Water is so important in an Islamic garden, both practically and symbolically. Water may vary from one simple square (circular) fountain in the center of *Akbariyeh* garden, to a great diversity of water-channels, pools, and fountains in *Fin* garden. However, as with the design of the garden as a whole, straight lines and geometry always predominate. In the larger, royal gardens, such as *Chehel Sutun* in *Isfahan*, there is more elaborate ways of directing water. There is no doubt also that the practical uses of the geometric layout and the symbolic qualities, running water in a hot climate also possesses health-giving and healing properties. The air that surrounds clean running water is always cleaner and cooler, and this is extremely pleasant and invigorating in a hot and sultry environment. The sound of water in fountains can have a soothing and uplifting effect (Clark, 2014).

Water is present both in functional and ornamental forms in Persian garden. Functional use of water is irrigation the plants at certain intervals. Straight and geometrically shaped waterways were the main means of so doing. Ornamental pools, fountains, and waterways in Persian gardens shows the pleasant and decorative aspect of water usage.

There is usually a square-shaped or rectangular pool right in front of the main pavilion. Wherever the ornamental function of the pool was more important, it was made shallower. Circulation the water in the garden in waterway through which water flowed into smaller, minor brooks directly from the pool. Such brooks were both ornamental and functional. “Waterfalls and fountains were made wherever the natural slope allowed so to make the water course more interesting. The main waterways were lined by shady trees in order to maximize the functionality of water in both mythological and ornamental aspects. Although waterfalls, fountains, and various types of pools were of originally ornamental function, they also worked to increase the evaporation, and consequently to make the garden cooler and more pleasant” (NBPGO, 2011:60).

Landscape aspect is one of the most important aspects of the water which with the help of other features seeks to create an allegory of paradise on earth. The Freshening and life-giving aspect enhances the landscape aspect but also increases local air moisture and coolness particularly during

warm seasons. The Audio aspect of water presence by different features such as fountains, ponds, pools, brooks, etc. have been used resulting in better achievements in showing water volume as well as eliciting various water symphonies in Fin garden. By the way, whenever necessary making extra unwanted noises has been avoided. In Shahzadeh garden, cascades and water noises play a key role in creating a relaxing atmosphere in the garden. The most major functional aspects of water presence are the irrigation of trees and other plants. Additionally, water is also used for cleaning purposes. Beyond all of the mentioned aspects, the spiritual dimension of water presence in the garden indicates meanings such as transiency, a sense of novelty as well as the freshness concept.

*Table 23. Significance of water features in envisioning the UA landscape in Persian garden*

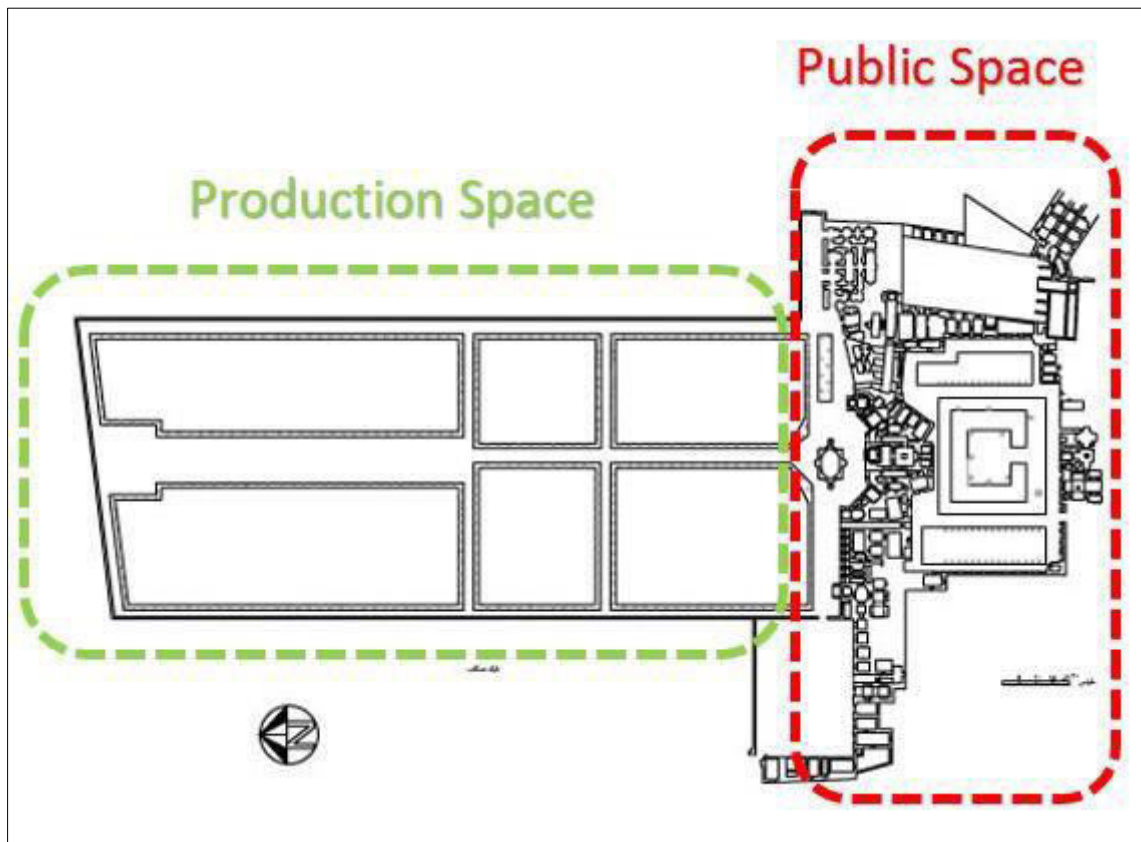
	<b>Guidelines</b>	<b>Role of Water</b>
<b>Attractiveness</b>	Focal point	Water pool, water stream
	Formal landscaping	Water stream in middle of the main axis Water feature around the mansion
	Artwork	Water demonstration in cascade form in Shahzadeh garden Water jets in Fin garden
<b>Functional guidelines</b>	Site layout and design	Alternative recreational programming due to the multiple presence of water A central meeting spot around the main pool of the garden Gathering space on the site around the water features
	Permanency of design	Permanency of position and structure of water fountains, water streams, and pools
	Social life	Accommodating the diversity of age, gender, and cultural background due to the water attractiveness Integrating children's water play Social programs related to water issues

As preceding table shows, from the UA development perspective, water play an indispensable role in demonstrating the suitability of the Persian garden for collective urban gardening. Firstly, water feature as the focal point, especially in adjacent of the mansion, promote the attractiveness of the site. Secondly, planting the ornamental and non-edible plants for decoration beside the water streams (e.g. *Fin*, *Eram*, and *Shahzadeh* gardens) or water surfaces (e.g., *Akbariyeh* garden) increase the palatability potential of theses historical gardens. Thirdly, playing the landscape



architects with water for demonstrating the artworks would be the other aspect of its potentiality for increasing the amiability.

Another essential character of water in Persian garden is strengthening the social life, due to diversity of age, gender, and cultural background are absorbed into water features and fountains. Thus, all the alternative recreational programming, a central meeting spot, and gathering space on the site, as well as integrating children's play, as the circumstances of public edible landscape, can be provided by preserving the traditional presence of water in traditional gardens, if we want to re-use of those gardens for enhancement the urban agricultural sites.



*Figure 62. Separation the productive space from non-agricultural zone in Akbariyeh garden as an opportunity for accommodating the collective urban gardening*

## **Garden plants**

The specific tree planting design of and appropriate selection of plants have played a key role in making shadows as well as suitable colorings during different seasons of the year resulting in a varied, hilarious and healthy environment. Plants arrangement system has been based on the



shadow casting pattern of the garden so for example in *Shahzadeh* garden along the main axis of the garden, a shaded section is seen on one side of the route at all hours of the day. In *Pahlavanpur* garden, in particular plane trees planted near water brooks provide an attractive scenery and healthy atmosphere.

Selection of plants in Persian garden includes:

- 1- The ever-green, wind-breaking and needle-leaved trees such as pines and cedars,
- 2- Shadow-casting trees such as wild and canopy elms, ash trees, plane trees and aspen (White poplar),
- 3- Decorative plants such as *Pyracantha*, *Juniperus*, and *Cotoneaster* which produces small flowers during winter time, and around water basins are adorned with flower pots in which beautiful flower bushes have been planted giving the garden a lovely landscape.
- 4- Fruit trees such as grape, apple, pear, apricot, pomegranate, quince, peach, black plum and other indigenous fruits which beyond edibles, create a beautiful colorful greenery in fruiting seasons.

We cited the role of plants and planting design in attractiveness the UA landscape. Those guidelines such as plants arranged in rows, formal landscaping, and integration the conifers and non-edible plants for decoration, all exist in Persian garden vegetation system.

*Table 24. Appropriateness the planting system of Persian garden with the health consideration of UA products*

<b>Guidelines</b>	<b>Role of plants and planting design</b>
<b>Health-oriented planting design</b>	Planting the structural and non-fructiferous trees in the outer border of urban garden in back of the property's wall
	Planting the pome and stone fruits in the medium boundary, between the garden and vegetation
	Cultivation the berries and vegetables in the central area of Persian gardens
<b>Usage of barriers between cultivation site and roads</b>	The wall system around the garden site
	Hedges and large stands of vegetation beside the wall

If we want to consider specifically into some of the case studies, it would be helpful to mention the plants and planting design of *Dolat Abad* and *Akbariyeh* garden. There are plenty of trees in *Dolat Abad* mostly pines, cedars and fruit trees. Fructiferous trees include grapevine and pomegranate planted inside Karts. Pine trees are positioned in two rows along the main axis of the garden and between winter and summer mansions. These trees have been substituted in the course of time and it has always been tried to replace decayed old trees with new ones. The oldest tree of the garden is an ancient mulberry tree located along the main entrance path of it. The garden is made of seven principal flowerbeds which are separated by water brooks and specific trees have been planted in each one of them. There are two flower beds at the north and south of the summer mansion that are mainly allocated to pomegranate trees with a few cedar trees alongside the water brook. In the two flower beds beside them mostly grapevines have been planted inside Karts which are irrigated by water brooks. In the two western flower beds of the garden, predominantly pomegranate trees and occasionally fig and olive trees have been planted. One of these flower beds is north of the pine trees row and the other is at the southern section. At the western part and opposite the winter mansion, a palm tree is seen which is distinguished among other trees of this garden due to its exotic type. Outside the main fence of the garden at the south, a pomegranate garden has been built in recent decades.

In Birjand gardens, a large number of plant species are indigenous ones including trees and shrubs. Non-indigenous species compatible with regional climate were added later. Due to the survivability of needle leaf plants in harsh climatic conditions, pine tree (*Pinus eldarisa*) is a persistent candidate for planting in Birjand's gardens. The intention of planting this ever green and tall plant (height over 15-20 m) was producing the shadow and decoration as well as a fine view to attract individuals and potential travelers. Another evergreen and high resistant plant in the mentioned region is Cedar (*Thuya orientalis*) which have a beautiful crown and because of their shortness attract the attention of visitors. Due to the rapid growth of its leaves, it must be pruned frequently during which it can be shaped to beautiful forms. Pistachio (*Pistacia vera*) is a productive tree planted abundantly in the garden as a main tree, due to its resistance against aridity and salinity, and economical productivity. Pistachio is a biped tree resistant against the hotness of summers and the coldness of winters. Pistachio has a deep root which makes it resistant to aridity and water shortage.



Figure 63. Tree mall and formal landscaping as an attractive and functional spatial values

Apricot (*Prunus armeniaca*) is widely planted in Birjand gardens for its fruit to be consumed fresh or dried. Its flowers appear before its leaves in spring and in fact it is one of the first trees which herald the coming of spring because of its beautiful foliage and pink colored blossoms. It has a long history of cultivation in Birjand. Hot and dry summers of Birjand region is a prerequisite for producing high-quality Pears (*Pyrus communis*) as a popular tree in Birjand gardens. The plant has a fall season and fruits of its different grades are produced from spring until autumn. Pears planted in the garden are of fast fruiting types known as Emrut which bear fruits late springs.

A limited number of Mulberry (*Morus alba*) is seen scattered at the margins of some gardens. They grow fast and have a wide crown. Additionally, their fruit does not have a high economic value but because it is the first fruit maturing in spring and due to its shadow casting property is a popular tree. Also, its fruit can be easily dried and consumed during winters. *Morus alba* is classified as a tree which turns yellow in autumns. Therefore, its autumn leaf falling and its naked trunk and branches in that season create a fantastic view. Fig tree (*Ficus carica*) which particularly

planted at the edge of side walkways, beyond its medical and commercial usages was planted as the live fence around gardens in order to prevent trespassing.

Pomegranate trees (*Punica granatum*) as the very resistant plant against water shortage is a multiple function tree in Persian gardens. Firstly, it has red flowers which appear in the middle of spring, which most of them bear commercial-valued fruits. Its potential for pruning is very high. Normally, its crown is almost rounded like a shrub which can be shaped easily. Beyond beautification, fruit bearing, and medicinal significance, pomegranate tree can serve as a high fence. For example in Akbaryeh World Heritage Garden, they prevent the entrance of people into the production section. They are planted at edges of the interior or exterior sidewalks and near walls for commercial purposes as well as their beauty effect and to prevent trespassing and finally at the margin of gardens sideways they are planted to produce fruits, shadow and beauty. Birjand gardens produce exclusive pomegranates which because of its unique characteristics are completely different from products of nearby towns.

Barberry (*Berberis vulgaris*) is an indigenous plant with a long history of regional plantation, which recently it has been welcome more than before by farmers. This plant turns yellow in autumns during which it bears a red fruit with many medical properties. Like the pomegranate tree, barberry is a multiple functional plant, due to the commercial and medicinal fruits, building the live fence and aesthetics functions in autumn and winter seasons.

Since the Akbaryeh garden has a history of severe water shortage in dry seasons, it seems that planting pistachio trees can serve as a good model and the dominant pattern for this garden due to its high resistance to aridity. For this reason, irrigation cycle of pistachio trees during dry seasons could increase two or three folds without hindering the growth system of trees and plants in the garden. For better usage of water, at the margins of the main water delivery routes of the garden (main streams) fructiferous and non-fructiferous trees have been planted in a condense manner which not only adds to the garden beauty but also results in producing crops such as Damascus rose, black fig and pomegranate.

It is noteworthy that planners have designed a mixture of surface running brooks and subterranean routes as required. Whenever the need to prevent wasting the water as a result of

evaporation was felt, water courses were taken underground but at times that the visual appearance and noise of water have been given priority; it has been transferred to the surface.

Actually, a balance between water consumption and visual pleasure has been established.

From the functional guidelines' perspective, the abovementioned explanation of two historical gardens illustrate that the plants and planting layout in Persian garden manage the accessibility within site by planting the vegetation beside the walkways and in compatible to the garden layout. Also, alternative recreational programming beyond the agricultural activities has been supported by planting the ornamental and decorative plants alongside the main axis of the garden and around the main building. Moreover, separating production from public space functions is another guidelines of UA landscape layout, which have been in consideration in Persian garden design.

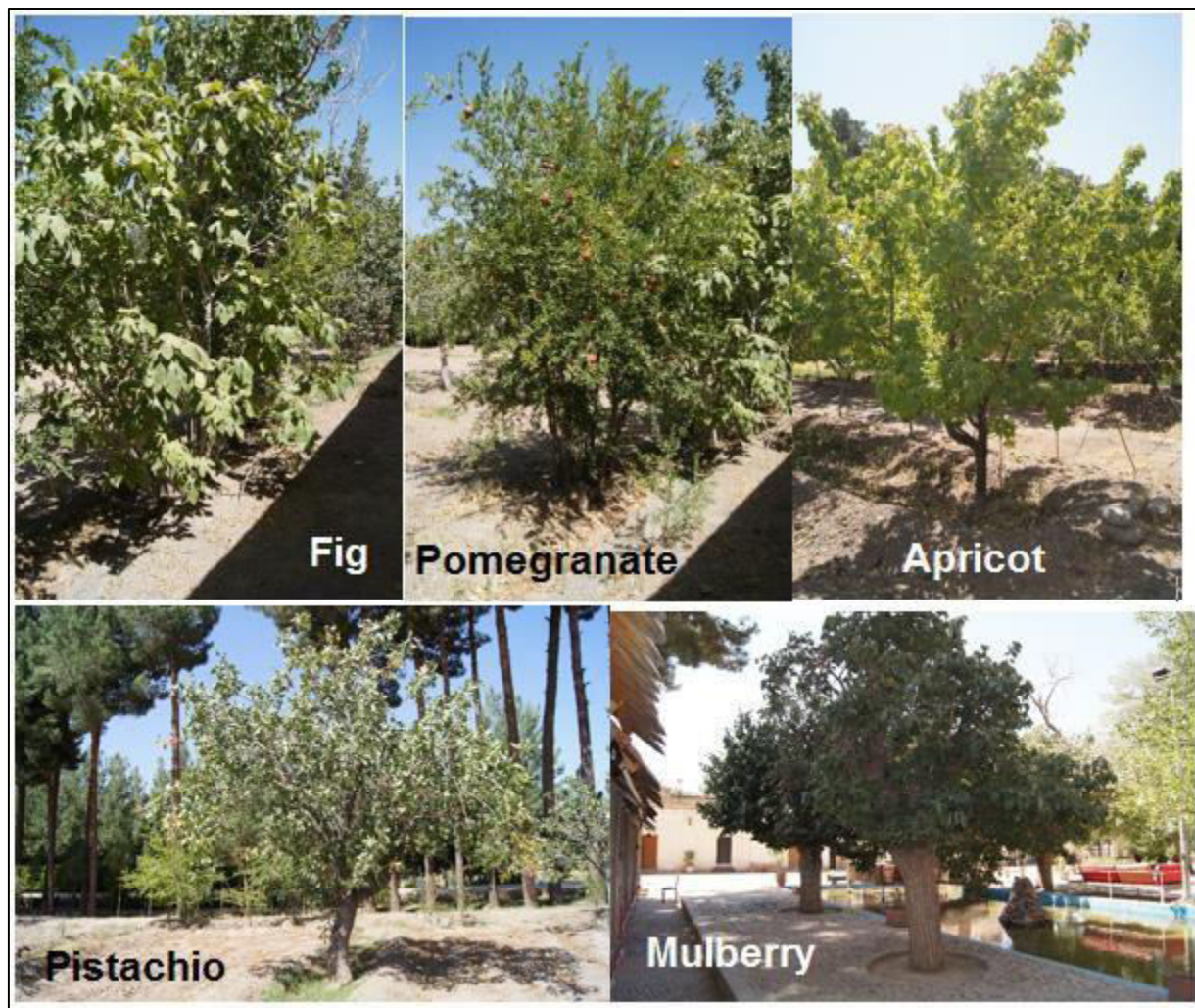


*Figure 64. Photos of some important decorative plants in Akbariyeh World Heritage Garden*

Table 25. Functional and attractive role of plants in realization the UA in Persian garden

	Guidelines	Role of plants in realization the UA in Persian garden
Attractiveness	Fencing	The huge vegetation around the garden periphery The dense planting alongside the axes
	Plants arranged in rows	Ornamental planting around the axis in row Planting the fruit-bearing trees in rows
	Non-edible plants for decoration	Existence the variety of flowers, ornamental bushes and trees
	Formal landscaping	Formal landscaping in the main axis, around the mansion, and private yards
	Integration the conifers	Planting the pine and cedar trees in historical gardens
Functional guidelines	Site layout and design	Separating production from non-agricultural space functions Guiding the visitor to the central spot by planting the structural plants
	Permanency of design	mature groves of trees thematic gardens such as fruit, medicinal, and indigenous gardens
	Flexibility	resilient design by utilizing the indigenous and resistant species adapt to seasonal variation by utilizing the appropriate indigenous plants
	Wholeness	distinguished from urban context due to the agriculture and gardening sceneries
	Social life	Accommodating the diversity of age, gender, and cultural background because of producing the variety of fruits Integrating children's play in agricultural ceremonies Social programs related to gardening and production Participatory design process for collective gardening





*Figure 65. Photos of different fructiferous trees in Akbariyeh World Heritge Garden*

## **Interim conclusion**

Beyond having the agricultural opportunities, gardening facilities, and production spaces, what does the Persian garden have which appropriate it for UA development?

Previous studies show the UA landscapes are the spaces beyond merely production spaces and greeneries. There are three spheres that determine the criteria and guidelines of UA landscape designing, programming and maintenance. For assessment the compatibility of the Persian garden for development the UA phenomena, it is inevitable to study the Persian garden's structure, design, and elements based on those multi-aspect guidelines.

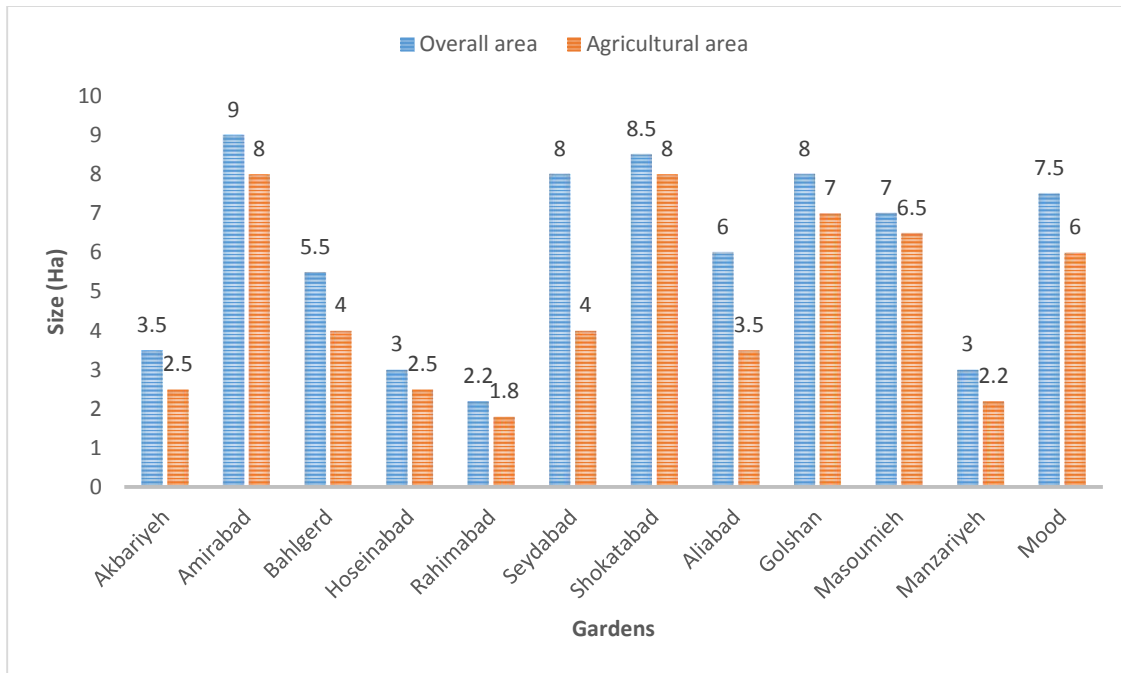


Figure 66. Agricultural area of 12 selected historic gardens (drafted based on information of Brijand's Historical Gardens Department)

The upper figure illustrates that a large proportion of the historic garden area was specified to the agricultural purposes. Interestingly, beyond having that great potentiality which is the basic spatial requirement for UA landscape development, correspondingly the structure, design, and heritages of Persian garden is compatible for accommodation the collective UA landscape. From the health viewpoints, the garden structural elements such as wall, architectural plants, and paths make the barriers and distance between the cultivation fields and outside streets and traffic routes. Furthermore, traditional styles of agriculture, horticulture, and livestock raising were organic and could be retrieved and completed by recent guidelines. Historical Persian gardens sites are historically the land use for cultivation and have not been changed from the polluted lands to gardens. Another capability of Persian garden for UA development is preparing the situation for considering the ecological concerns. Value of native plants, preserving local species, traditional agriculture, and cultivation wide variety of species and flowering plants, are the multi aspects of traditional gardening and landscaping in Persian gardens. While in recent decades some of those traditional gardening techniques, native species, and local engineering have been ignored or forgotten, the UA development would be the incentive for revitalization the local customs in ecological and sustainable gardening and farming.



From the socio-cultural perspective, Persian garden shows the high suitability for UA development. Having formal landscaping, non-edible plants for decoration and artwork increase the attractiveness of Persian garden for collective productive landscape. Historical gardens with having the multidimensional spaces and tangible heritages is an appropriate urban space for organizing the multiuse programming, including non-gardening programs and diversity and opportunities for artistic expression. The garden wall as a property fencing limits the physical access to the site and increases the yields security. Separating production and public space functions, having a central meeting spot would promote use by many and diverse users without being a disturber for the gardening activities. Beyond all, the beauty, freshness, exceptional greenery and healthy environment of the Persian garden which is a historic achievement in designing the multifunctional landscape would be an aesthetically pleasant experience for the urban gardeners.

One strategy for utilizing the Persian garden capacities in UA development would be reinterpretation of cultural landscape as agricultural garden, or the creation of urban gardens including agriculture. This implies that the Persian garden not only has the cultural-heritage values, but it also provides agricultural services. The basic components of this strategy are the appropriate circulation network, the garden elements, design and structure that allows an extended experience of the garden without restricting production, and possibility of integration the agriculture and other uses in the historical gardens.

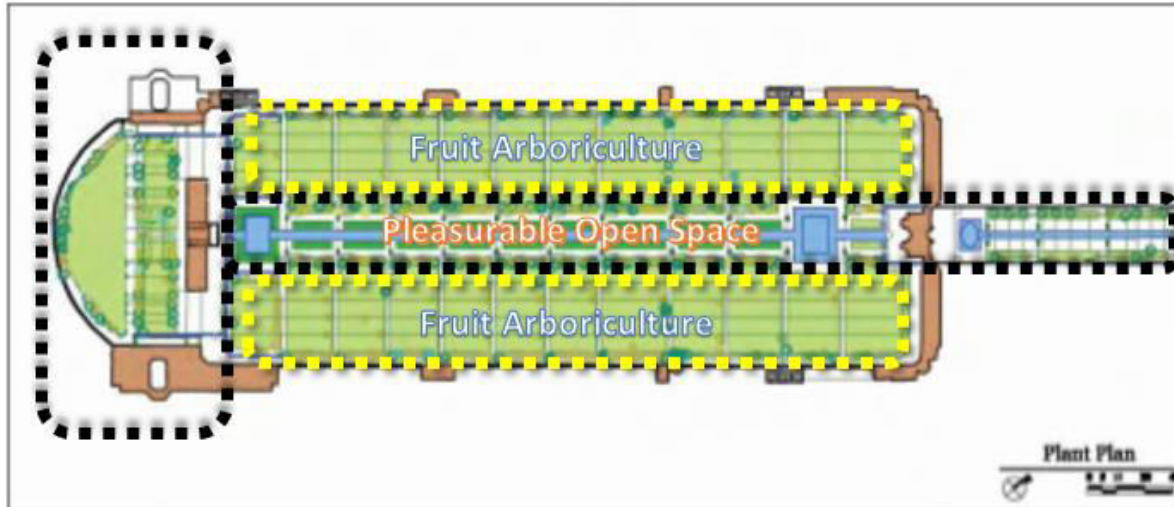
Garden facilities are provided for different purposes. Sometimes there are simply places to rest, while in other cases these are combined with a scenery of the agricultural landscape. In fact, in addition to introducing the Persian garden as UA site, communicating the garden has the special significance. “Bringing the area to people’s awareness and enhancing knowledge of agriculture and landscape are of the main goal of communication concepts” (Timpe et al., 2016: 132). Additional goal is reducing disagreements between agricultural productivity, additional greenery functions, and human use of the garden, by creating mutual respect between the different users. So that, the value of the cultural heritages goes beyond the historic- and museum-oriented approach, and the garden will become an ordinary space for inhabitants gardening activities.

Based on the mentioned explanations the Persian garden has the potentiality to create opportunities for public involving in consumption, education, and co-production the agricultural

goods. The combination of different goals, whether commercial, educational, social, therapeutic or environmental, can be considered a success factor for place making the garden through urban agriculture. Under this strategy the historical gardens would be a place of interaction between different user groups including the employees and trainees of UA workshops, pupils and youth groups, and citizens regularly visit their rented gardening plots, and visitors looking for recreation in the historical green spaces come to the garden as customers.

In this new perspective, the attractiveness of the urban agriculture place is supported by the historic elements of the garden, the opportunity to produce agricultural goods together with other people, or simply consume products from a well-known landscape heritage. Now, we can conclude two main strategies which are critical for development the UA in Iran:

- **Placemaking strategy:** the spatial and environmental design of Persian garden can be introduced as a model and reference for designing the new urban agriculture landscapes.
- **Public-involvement strategy:** getting involved the urban inhabitants for re-programming the remnant historical gardens for accommodating the edible public greenery.



*Figure 67. The spatial separation the fruit arboriculture zone from the pleasurable open space in Persian garden is a spatial requisite for accommodating the collective agriculture*

Table 26. Appropriateness the Persian garden for development the urban agriculture (UA) based on criteria derived from health consideration

Mentioned concerns	References	Persian Garden	Implication in garden's future	Extension in UA development
<b>toxic elements and plant uptake</b>	(Cruz et al., 2014)	Most of the garden lands are not toxic, due to were specified to traditional cultivation	❖	❖
<b>Barriers between cultivation site and roads reduce trace metal content</b>	(Säumel et al., 2012)	The garden structural elements such as wall, architectural plants, and paths make the barriers between the cultivation fields and outside streets and traffic routes	❖	❖
<b>Buildings and large stands of vegetation reduce airborne pollutant influxes</b>	(Säumel et al., 2012)		❖	❖
<b>Planting guidelines for urban horticulture to healthy food Production</b>	(von Hoffen & Säumel, 2014)	Traditional styles of agriculture, horticulture, and livestock raising were organic and could be retrieved and completed by recent guidelines	❖	❖
<b>Site pollutions considered in garden concepts and guidelines</b>	(von Hoffen & Säumel, 2014)	Historical Persian gardens sites are historically the land use for cultivation and have not been changed from the polluted lands to gardens	❖	❖
<b>growing mushrooms for the Edible City</b>	(Schlecht & Säumel, 2015)	Cultivation the mushrooms is not custom in Persian gardening, maybe an idea for the future	❖	❖
<b>Importance of healthy soil</b>	(Wilschut, Theuws, & Duchhart, 2013); (Mitchell et al., 2014); (Grewal & Grewal, 2012)	Heavy metals have not yet polluted garden soil, but can be more considered in maintenance procedure	❖	❖
<b>Lush vegetation prevents contact with the polluted soil</b>	(Wilschut et al., 2013)	Garden soil has not yet been polluted by heavy metals, but this guideline can be considered in maintenance procedure	❖	❖
<b>Air pollution negatively influences crop yield</b>	(Agrawal, Singh, Rajput, Marshall, & Bell, 2003)	In many regions, the garden has a distance to the air polluted by traffic, but in another area, the structural barriers of the garden can reduce the effect. Also, the guideline should be considered	❖	❖

Table 27. Appropriateness the Persian garden for development the urban agriculture (UA) based on concerns derived from ecological criteria

Mentioned concerns	References	Persian Garden					Implication in gardens future	Extension in UA development
		History	Principle	Program	Space	Element		
Value of native plants	(Moro, Westerkamp, & de Araújo, 2014)	❖	❖	❖	❖	❖	❖	❖
preserving local species	(Norfolk, Eichhorn, & Gilbert, 2013)	❖	❖		❖	❖	❖	❖
Traditional agriculture	(Norfolk et al., 2013)	❖			❖	❖	❖	❖
cultivation wide variety of species	(Norfolk et al., 2013)	❖			❖		❖	❖
Urban cultivation maintains soil qualities	(Edmondson, Davies, Gaston, & Leake, 2014)	❖			❖	❖	❖	❖
Planting variety of flowering plants: native, near-native and exotics	(Salisbury et al., 2015)						❖	❖
Promotion the ecosystem services	(Derkzen, van Teeffelen, & Verburg, 2015)	❖		❖	❖	❖	❖	❖

Table 28. Appropriateness the Persian garden for development the urban agriculture (UA) based on concerns derived from planning, designing, and programming criteria

Mentioned concerns	References	Persian garden					Implication in garden's future	Extension in UA development
		History	Principle	Program	Space	Element		
UA as urban green infrastructure	(Panagopoulos, González Duque, & Bostenaru Dan, 2016); (Madaleno, 2000)	❖			❖	❖	❖	❖
decrease UA pollution	(Panagopoulos et al., 2016)	❖			❖	❖	❖	❖
UA to increase quality of life	(Panagopoulos et al., 2016)	❖	❖	❖	❖	❖	❖	❖
formal landscaping, nonedible plants for decoration and artwork	(Morckel, 2015)	❖	❖	❖	❖	❖	❖	❖
attractiveness in UA	(Morckel, 2015)	❖	❖	❖	❖	❖	❖	❖
importance of maintenance	(Morckel, 2015)			❖			❖	❖
assistance from municipal and nongovernmental agencies	(Morckel, 2015)	❖		❖			❖	❖
sybiotic programming of food growing and public space	(Napawan, 2014)	❖	❖	❖	❖	❖	❖	❖
integration food- growing within lawn spaces	(Napawan, 2014)	❖	❖				❖	❖
Multiuse programming, including non- gardening programs	(Napawan, 2014)	❖	❖	❖	❖	❖	❖	❖
fencing to limit physical access to the site		❖	❖	❖	❖	❖	❖	❖
separating production and public space functions	(Napawan, 2014)	❖	❖	❖	❖	❖	❖	❖
a central meeting spot	(Napawan, 2014)	❖	❖	❖	❖	❖	❖	❖
promotes use by many and diverse users	(Napawan, 2014)	❖	❖	❖	❖	❖	❖	❖

Mentioned concerns	References	Persian garden					Implication in garde 's future	Extension in UA development
		History	Principle	Program	Space	Element		
farmers' markets in public space: permanency of design, flexibility, wholeness, and social life	(Francis & Griffith, 2011)				❖	❖	❖	❖
design to meet multiple needs	(B. Lin, Meyers, & Barnett, 2015)	❖	❖		❖	❖	❖	❖
Integrating community gardens into public landscapes	(Middle et al., 2014)				❖	❖	❖	❖
Collection of tree products by poor households	(Kaoma & Shackleton, 2014)	❖			❖	❖	❖	❖
Producing edible landscapes in urban greenery	(McLain, Poe, Hurley, Lecompte-Mastenbrook, & Emery, 2012); (Grewal & Grewal, 2012)	❖			❖	❖	❖	❖
Strengthening access to restorative places	(Hansen-Ketchum, Marck, Reutter, & Halpenny, 2011)	❖	❖	❖	❖	❖	❖	❖
UA in available public spaces and vacant lots	(B. B. Lin, Philpott, & Jha, 2015); (Corrigan, 2011)				❖		❖	❖
UA as therapeutic landscape	(Milligan, Gatrell, & Bingley, 2004)	❖			❖	❖	❖	❖
Design of community gardens	(Hale et al., 2011)				❖		❖	❖
Importance of biophysical and socio-emotional processes	(Hale et al., 2011)	❖	❖				❖	❖
gardening connects to cultural roots	(Hale et al., 2011)	❖	❖	❖		❖	❖	❖
aesthetically pleasant experience	(Hale et al., 2011)	❖	❖	❖	❖	❖	❖	❖
convert landscaped lawns to productive use	(Teig et al., 2009)						❖	❖

## **Chapter 8 : The Role of Persian Garden in Envisioning the Urban Agriculture in Iran<sup>6</sup>**

Until now, the different aspects of the integrative productive-pleasure landscape, as well as its foundations and features in the Persian garden, have been discussed. On the other side, the architectural characteristics of the Iranian landscape emphasizing the integration approach has been introduced. In fact, the Iranian version and circumstances of integrating the utilitarian agriculture into pleasure gardening have been recognized through librarian studies as well as the field surveys and interviews. Therefore this perspective into Persian gardens to introduce the principles of designing the integrative landscape based on the Iranian version has been firstly considered in this study. The relevant result of this research answers the question of how the combination of Persian gardening design and landscape planning can be the starting point for the proposal of urban agriculture becoming the tool for Iranian cities.

In this chapter, the discussion will be about how the Persian garden would be the starting point of envisioning the urban agriculture in Iranian cities. The circumstances of Persian gardens which emphasize their role as a tool for city and landscape planning under the umbrella of urban agriculture are as follows:

- Persian Garden: Iranian version of designing the multi-functional open space; the software aspect of Persian garden and its basis for proposing the principles (intangible)
- The elements and structure of Persian gardens: include the hard elements such as buildings, paths, and wall, and the soft elements such as trees; the hardware aspect of Persian gardens and its physical-environmental basis for envisioning the urban agriculture
- Regulations and laws of the conservation of the historical gardens under the sovereignty of organizations in charge; the legal basis for stability
- The possibility of integrating the Persian garden System into the concept of Continues Productive Urban Landscapes (CPULs); flexibility at the stability

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<sup>6</sup>A summary of this chapter has been published in the *Proceedings of 1 Lebanese Landscape Association Conference on Unfolding Middle Eastern Landscapes* (Beirut, Lebanon 31 May – 2 June 2016)

- The possibility of continuing the principles of Persian edible landscape architecture in urban open spaces, parks, and green spaces
- Persian gardens as a successful public space; potentiality to civic engagement, urban agriculture education and the extension of relevant skills and methods.

Reviewing the experiences of other countries, the executive projects, and scientific studies ensure that one of the interdisciplinary solutions would be the integration of agriculture in landscape and open space development (subsequent figure).

## **An outlook into the urban historical gardens in Iranian cities**

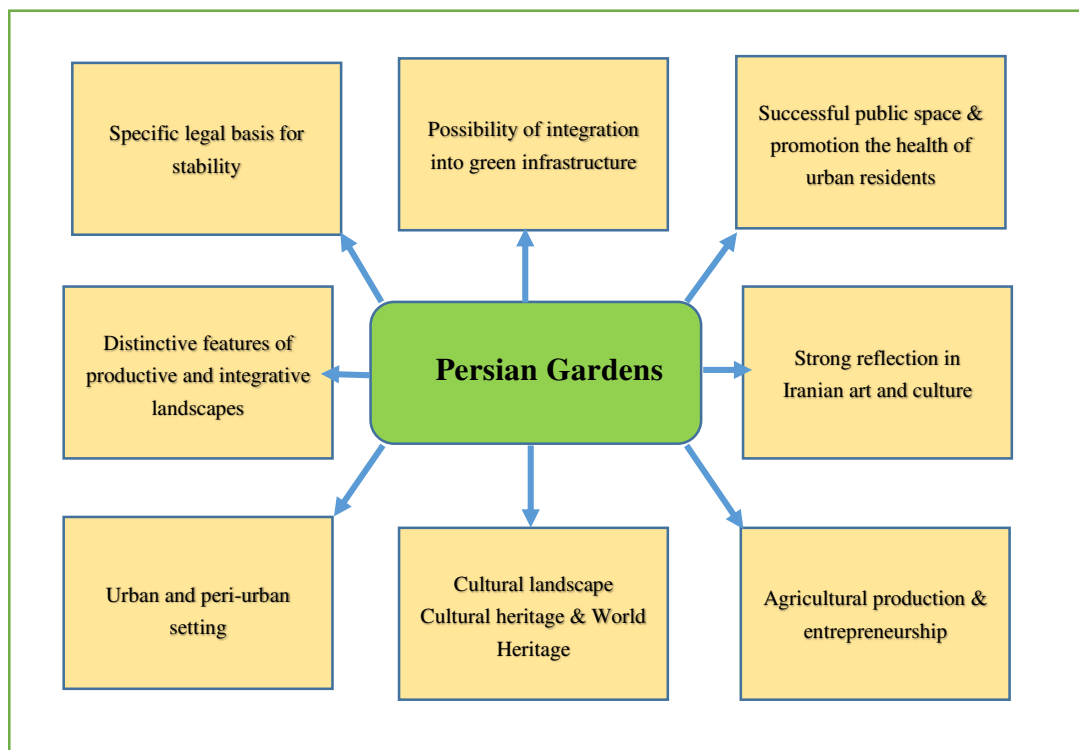
Historical Persian gardens as open spaces in which crops and orchards are fostered are primarily defined by their spatial dimensions and properties and have specific features concerning their form, structure, color, and atmosphere. In fact, during the decades of urban sprawl, the gardens which were located outside the city boundaries were being enclosed by the gray infrastructure. Beyond these types, there are urban gardens which were originally located inside the city, to provide administrative and ceremonial open spaces. Some of these gardens like the El-Goli historical garden in Tabriz (North-West of Iran) were genuinely designed and constructed for leisure and recreation (Pouya, Demirel, & Pouya, 2015). Beyond these two types, some of the wealthy citizens had gardens attached to their housing properties, which were smaller than the agricultural gardens. Nowadays, and after the severe land uses changes in Iranian cities, some of those mentioned historical gardens have been protected, registered in the Iran's National Cultural Heritage, and fortunately some of them have been certified World Heritage by UNESCO.

One of the common zones in Persian gardens is agricultural and productive greenery. 'Where existing agricultural areas have been integrated into the city through its expansion over time; they usually contain important structures and elements of cultural and landscape heritage' (Lička & Maldonado, 2016: 119). It applies to Persian gardens, looking beyond their valuable landscape, they also provide a particular atmosphere of traditional multifunctional environmental design. Many different historical gardens as cultural remnants can usually be found, are more or less observed and, dispersed in the urban areas. Thus, an appropriate use, reuse, rehabilitation, and valorization of Persian gardens as cultural heritage to transmit its values, and potentials to the future are crucial to enhancing the quality of urban agriculture spaces.



In contrast to most urban agricultural spatial forms which provide the potential for temporary land occupation, the Persian urban gardens are permanent. They are not temporal gardens and represent a distinct spatial function that provides the inhabitants with benefits. But despite the permanency of the space form of historical gardens in the city structure, their productivity and profitability in some cases are temporal, with a sharply fluctuating maintenance profile.

As the following figures illustrate, this project found the urban historical gardens as a tool for revitalizing urban landscape design through communicating the principle of integrative multifunctional landscape of Persian gardens to urban parks and green spaces as well as allotting the civic society with historical gardens- for example through community gardens or urban farms.



*Figure 68. The great potentiality and significant of Persian gardens in Iran*

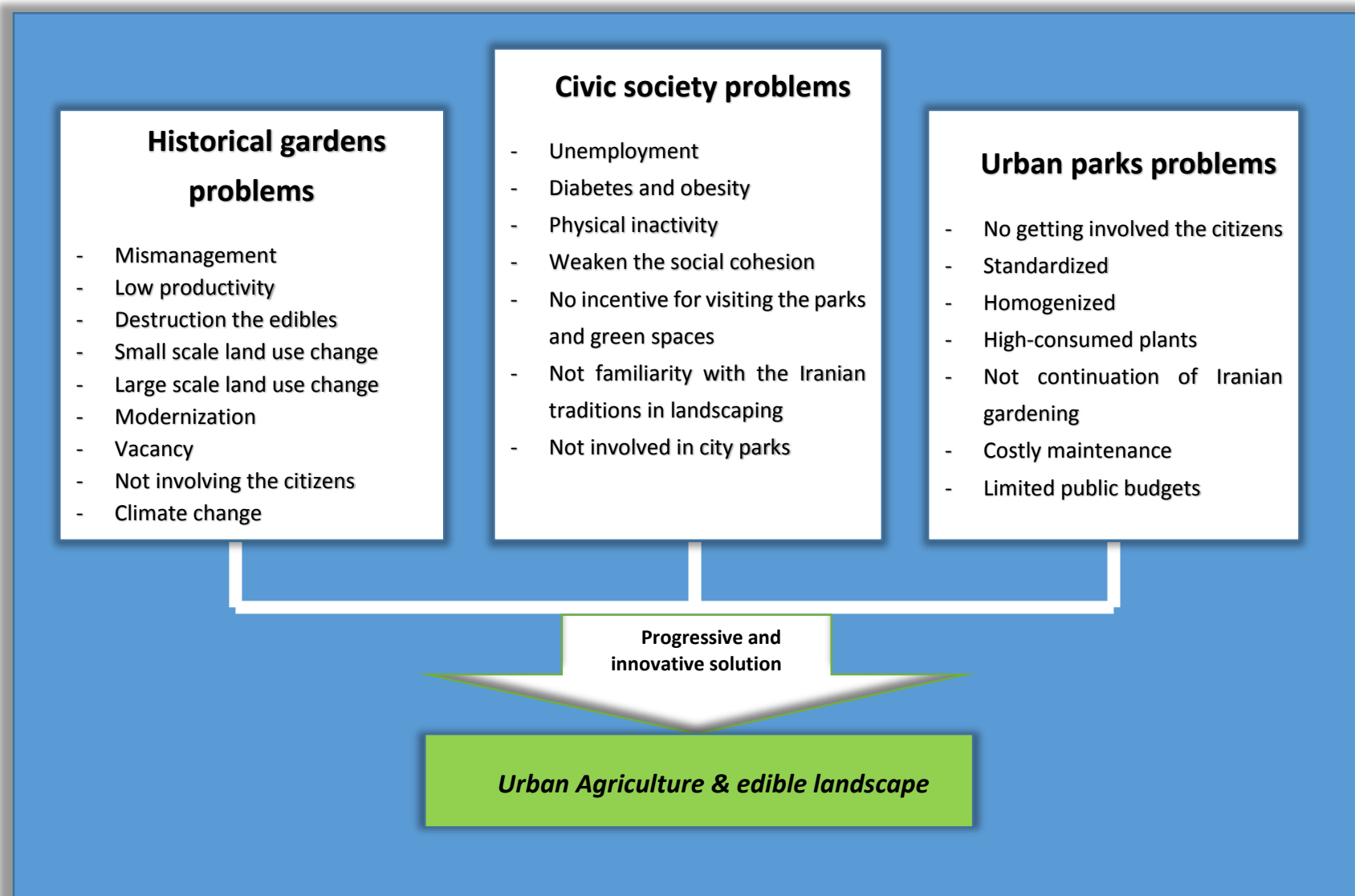


Figure 69. Innovative approach to urban agriculture as the principle solution for socio-environmental problems in Iran

In this section presenting a brief pathology of the Iranian historical gardens makes the way more clear for the significance of urban agriculture in making the garden healthy and productive again.

### **Historical garden at risk of the elimination of the edible landscape**

Although the lack of maintenance can quickly transform the gardens (Pouya et al., 2015), the degradation of the edible landscapes in some of the historical gardens during the years is the result of multifaceted changes which have not yet been studied comprehensively. With the development of the major cities and consequently the increased need for green space and recreational areas for citizens, this historic garden has become a public promenade and park which is at risk and threatened by the change in land use. Many gardens in Iran have lost historical value after being transformed into parks. With the increasing number of visitors to these parks, overcrowding becomes a major problem. The pressure for development and the limited resources available for the conservation of the landscape are significant factors in the management of gardens in Iran (Pouya et al., 2015).

For instance, there are no anymore fruit trees in Fin and Chehel Sotun World Heritage gardens despite the presence of edible-bearing plants in the mentioned gardens during the last decades and centuries (Jayhani and Emrani, 2007). Eliminating the productive and fruit-bearing fruits is coincided with converting the fields into ornamental scenery which presents an unauthentic picture of Persian gardens to the visitors. Unfortunately, this problem is not limited to the famous and prestigious royal gardens, rather to the unknown gardens like Masoumieh historical garden in Birjand also struggle with the disease of unproductivity. After the death of fruit trees in Fin and Chehel Sotun, the Bahlgerd and Masoumieh historical gardens are another cases of historical garden in Iran which the productive landscape is struggling between life and death.

The elimination of the productive landscape is not merely the death of fruit trees but, also the agricultural activities, traditional customs, local genetics resources, and the spirit of place will lose.



*Figure 70. Elimination the edible landscape by displacement the indigenous edible-bearing plants with the ornamental lawns and exotic plants in Fin (up) and Chehel Sotun (down) historical gardens*





*Figure 71. Deterioration the productive greenery in Bahlgerd (top) and Masoomieh (down) historical gardens*

## **The potentiality of Persian garden in envisioning the urban agriculture in Iran**

For different reasons, productive land and garden plots have not yet been part of Iranian landscape design throughout the new garden and park history of the twentieth century, except the parks that have been gardens before their construction and renovation into public spaces. Therefore, there is not a systematic approach into planting the edible-bearing plants in Iran's public parks under a whole umbrella of planning and design the urban agriculture concept. But interestingly, the Persian gardens as the remnant of the previous landscape generations have been surrounded by the city infrastructure, and the civic society now live in some cases adjacent or within a short distance of these gardens. For many reasons, these historical garden can play a significant and no replaceable role in envisioning the urban agriculture in Iranian cities and landscapes.

The potentiality of Persian gardens in envisioning the urban agriculture can be discussed from four perspectives:

- Governmental legacy on conservation the Persian gardens
- Appropriateness of the elements, structure and design of Persian garden for the development of urban agriculture
- The possibility of integration the urban historical gardens into the concept of Continues Productive Urban Landscapes (CPULs)
- Persian gardens as a successful public space; potentials for public engagement, urban agriculture education and extension of the relevant skills and methods.

### **Governmental legacy on conservation the Persian gardens**

Regulations and laws which prohibit the land use change of the gardens both within the city and the gardens of suburban territories guarantee the legal basis of continued garden presence as the centers of agricultural production in Iran. In this section, the most important of these laws are mentioned (following table).

These regulations can be categorized into four groups:

- Rules for preservation the agricultural and production land use of farming lands and gardens which are located inside or outside the cities:
  - The law of “*Preservation the Agricultural Lands and Gardens*” approved by Islamic Parliament of Iran in 1995
  - Amendment Act of the law of “*Preservation the Agricultural Lands and Gardens*” in 23.10.2006
  - “*The Executive Regulation*” of the “*Law of Preservation the Agricultural Lands and Gardens*” approved in 2007
- Laws for preservation the urban gardens as a type of green space land use with focusing on its vegetation
  - The law of “*Preservation and Development the Green Space and Prevent Deforestation*” approved by National Parliament in 01.08.1973
  - The “*Legal Bills on Preservation and Development the Green Spaces in Cities*” approved by Revolutionary Council in 22.05.1980
  - “*Law Reform of Legal Bill the Preservation and Development of Green Space in Cities Authorized by the Revolutionary Council in 1980*” passed by Islamic Parliament of Iran in 2009
  - By law the “*Revision the Law of Preservation and Development the Green Space in Cities Authorized by The Revolutionary Council in 1980*”, authorized by the Expediency Discernment Council of the System in 04.08.2009
- Laws for protection the gardens which have been recorded as the National Cultural Heritage by the Iranian Cultural Heritage, Handicrafts and Tourism Organization (ICHHTO)
- Rules for protection and management the gardens registering as the World Heritage by the UNESCO

Table 29. The main protective provisions of gardens and productive greenery in Iran

The trustee	Included & targeted gardens	Year of approving
Ministry of Agriculture	Outer urban gardens	1995-2006-2007
Municipality	Urban gardens	1973-1980-2009
National Heritage Org.	National monuments gardens	1930-1932-2002
UNESCO	The World Heritage Gardens	2011



Figure 72. A decade ago aerial perspective of Fin World Heritage garden that now is struggling with losing its historical cedar trees, after deterioration its fruit bearing trees. Resource of picture: Jayhani & Emrani (2007: 84)

### Legal basis for preservation the urban gardens

Article one of the law “*Preservation and Development of Green Space and Prevent Deforestation*” says: ‘To maintain and expand the green space and prevent of deforestation, prohibited the cut of any types of trees within legal limits of cities without permission of municipalities in each of city, and in rural without the authorization of the Ministry of Agriculture and Natural Resources’. Also, Article six of “*Legal Bills on Preservation and Development the Green Spaces in Cities*” mentions: ‘Whoever knowingly and deliberately contrary to the provisions of this Act commits cut or cause destruction of trees misdemeanor shall be subject to the law providing for up to three years and will be sentenced to pay fines based on the type and age of the tree and its location from one thousand to one hundred thousand Rials’.



Note one of that legal bills mentions that: ‘If the owners cut the trees somehow that deteriorate the garden and use the land for housing, all the land will be recorded for the benefit of municipalities to be utilized for public services and the dispossessed people.’ Furthermore, the law of “*Preservation the Agricultural Lands and Gardens*” is obliged the Ministry of Housing and Urban Development to design the development of towns and cities (connected or detached) as possible in out of crop cultivation field and garden, potentially or actively, and use of nonagricultural lands to minimize the land use change of gardens and agricultural lands within legal limits of cities.

In Bylaw the “*Revision the Law of Preservation and Development the Green Space in Cities Authorized by The Revolutionary Council in 1980*”, special consideration has been taken into conservation and development the urban gardens. That Bylaw uses the statement “Garden” to the environments that at least have one of the following circumstances:

- Having at least 500 square meters, in the case of building and constructions in the land, in average one tree in sixteen square meter in open area; and in the event of lack of development, in average one tree in every twenty-five square meters including fruit or non-fruit tree or a combination of them are planted. Elimination of the trees will not cause the fraction of statistics the number of deteriorated trees.
- Having the proof of ownership entitled as the garden, orchard, wooded land, and garden mansion.
- Having a recorded vote as the gardens, open lawns, wooded setting of Urban Land Commission Act Article XII.
- The places in city limited area that have been identified as the “Garden” by the Ministry of Agriculture
- The sectors that have been designated as the “Garden” by the City Council.

That Bylaw defines the urban green spaces as the wooded areas and vegetation within the boundaries of cities, which are on the public property, government or private proprietorship. Note one of Article four of the recently mentioned bylaw points out the preservation and irrigation of green spaces in the areas like gardens and yards is under the responsibility of owners, residents

(beneficiaries) and their occupants. Consequently, Article 10 of this bylaw (“*Revision the Law of Preservation and Development the Green Space in Cities Authorized by The Revolutionary Council in 1980*”) has obligated the municipality to provide certificate information of the urban gardens covered with the following characteristics, and maintain them up to date.

- A. Registration plate number or license plate numbers are subject to renewal.
- B. The area of the property.
- C. The exact address, including city, region, district, street, street number, the name of the owner or beneficiary.
- D. The number and characteristics of each tree to the law by the fruitful and fruitless trees.

Based on the Note one of this Article, those gardens in any way, even if cut all the trees, will not be excluded of Garden’s title without legal permits. On the other hand, Article 13 points out to preserve the gardens especially in cities where green space per capita is less than the standard, Minister of Housing and Urban Development and municipalities are required to predict the gardens in urban master plan studies under the category of green space. The Note one of this Article by providing the legal basis for the municipalities and city councils to purchase the city gardens, to be made and established the public parks and gardens in them, will have two aspects about the agricultural landscape. If the farming greenery and their specific fields would be protected and activated, these type of gardens will be the hub of urban agriculture. But, if establishing the public parks would terminate to eliminating the agricultural identity of the garden, it will weaken the urban farm development. Fortunately, Note two of the last mentioned article suggests: ‘Municipalities must preserve the large urban gardens provide as much as possible support for their owners’.

### **Legal basis for the protection of the non-urban gardens**

In the regard of the gardens which are located outside the city limits, Article one of the Law of “*Conservation the Farming Lands and Gardens*” its Amendment Act points out: ‘In order to preserve the land use of agricultural fields and gardens, and their continuity and productivity, from the enactment of this law, changing the land uses of farms and garden outside of cities and towns except in urgent situation is prohibited’.

Of course, Note four (Amendment) of that Law says: ‘The construction of greenhouses, fish farming, poultry, livestock and other agricultural production, workshops of dietary supplement industries in rural areas, will be taken into consideration as the optimizing the farm production and will not be considered as the land use changes. These cases were excluded from the provisions of this Article, and shall be in compliance with environmental regulations is permitted with the approval of Agricultural Organization’.

Article nine (Amendment) of that law also says: ‘In order to support the sustainability of farms and gardens locating within the boundaries of cities and towns, which in the comprehensive plans as well as in the detailed plans are mentioned the agricultural land use, the state and municipalities are required to facilitate the urban services for the owners in accordance with municipal green spaces’ tariffs’.

*“The Executive Regulation of the Law of Preservation the Agricultural Lands and Gardens”* approved in 2007 prohibits any action to prevent exploitation and the continuation the productivity of agricultural lands and orchards including the construction of buildings, removing or increasing sand and other measures which may change the land use at the discretion of the Ministry of Agriculture. The Interior Ministry obliges Article 15 of that law, the Ministry of Housing and Urban Development, Environmental Protection Agency, Organization for Registration of Deeds and Properties, Police and other relevant authorities of the Islamic Republic of Iran to implement the necessary cooperation with the Ministry of Agriculture.

### **UNESCO and ICHHTO legacy in protection of the registered gardens**

Beyond the national laws, the international rules support the existence and preservation of the historical urban gardens. UNESCO has registered nine gardens of Iran in World Heritage list under the category “Cultural Landscape”, and those gardens are being conserved based on UNESCO regulations (subsequent figure and table).



Figure 73. Map of location the World Heritage's Persia gardens in Iran (Source of base map: [http://www.lonelyplanet.com/maps/middle-east/iran/map\\_of\\_iran.jpg](http://www.lonelyplanet.com/maps/middle-east/iran/map_of_iran.jpg))

Table 30. Iran's World Heritage Gardens

Name & Location	Province of location	Area
Ancient Garden of Pasargadae	Fars	Property: 249.65 ha Buffer zone: 2,006.95 ha
Eram Garden	Fars	Property: 12.7 ha Buffer zone: 70.5 ha
Chehel Sotun Garden	Isfahan	Property: 5.8 ha Buffer zone: 28.92 ha
Fin Garden	Isfahan	Property: 7.6 ha Buffer zone: 173.4 ha
Abas Abad Garden	Mazandaran	Property: 420.2 ha Buffer zone: 1,169.65 ha
Shahzadeh Garden	Kerman	Property: 5.5 ha Buffer zone: 6,181.5 ha
Dolat Abad Garden	Yazd	Property: 8 ha Buffer zone: 72 ha
Pahlavanpur Garden	Yazd	Property: 3.5 ha Buffer zone: 28.5 ha
Akbariyeh Garden	Southern Khorasan	Property: 3.4 ha Buffer zone: 8.6 ha

Each garden is recorded in the National Heritage List and therefore protected according to the Iranian legislation. Protection provisions established for the gardens and their 'buffer zones', defined according to the Iranian law in force, are also included in the Master Plans, the approval of which is issued by the Higher Council of Architecture and Urban Planning, in which also the Head of the Iranian Cultural Heritage, Handicrafts and Tourism Organization (ICHHTO) sits.

The existence of the National ICHHTO Base for the Persian Garden ensures that the management framework is one for the whole series, granting the coordination and harmonization of strategies and objectives. The Management Plan includes goals common to all component gardens of the series and also a program for strengthening the presentation and promotion to the public has been developed.

UNESCO recommends that the State Party gives consideration to the following:

- a) Finalize and approve the Management Plan for the Persian Garden and each of its components,
- b) Amend the provisions concerning the height of the buildings in Dolat Abad and Akbariyeh gardens buffer zones to allow buildings with two stories and a maximum height of 4.5m,
- c) Ensure that conservation work respects the principles of prudence and have minimum intervention and develop programmed maintenance plans for each garden, to maximize the available resources,
- d) Proceed carefully on any possible future measure concerning the replacement of plants beforehand and by particular scientific investigation,
- e) Implement a strategy for dealing with natural or manmade disasters as soon as possible for each garden, following common principles established for the whole serial property,
- f) Establish at each ICHHTO Provincial Base a monitoring body that includes representatives from all relevant institutions and agencies for monitoring purposes.

### **Appropriateness the heritages of Persian garden for development the urban agriculture**

There are tangible and intangible heritages in the Persian gardens which have a close relationship with the future of urban agriculture. In Iran, redundant historical gardens in Intra- and

peri-urban areas can serve as a basis for urban agriculture. Astonishingly and thanks to the structure and spatial design of Persian gardens it is appropriate to establish the urban agricultural features, activities, and spaces. Historical Persian gardens are the first examples of Iranian green spaces that have developed a complex relationship with the cities and become one part of public spaces from the 11<sup>th</sup> century until now that are still being used actively by urban dwellers (Rostami, Lamit, Khoshnava, & Rostami, 2016).

The elements which constitute the historical gardens are buildings, paths, wall, trees, and water. Tangible heritage is the hardware aspect of Persian garden and its physical-environmental basis for envisioning the urban agriculture. Urban garden spaces are primarily structured by hard and soft features and elements as well as by agricultural activities. These gardens have their particular structure and characteristics, but also represent a significant potential for some nonproductive activities and amenities relevant to the quality of life of urban dwellers. As pointed out in previous chapters they contain spaces for leisure and recreation, social interaction, education, as well as ecosystem preservation.

European experiences have proved the synergy of cultural heritage and agriculture. ‘Three main factors constitute the cultural heritage of an urban agricultural landscape: landscape quality, historic landscape characteristics, and historic landscape traditions’ (Branduini et al., 2016: 147). Landscape quality determines how the landscape is seen, perceived, and interpreted by people. Historic landscape characteristics constitute the present-day physical patterns, and historic landscape traditions respect to techniques and customs still in use.

While urban gardeners- including those of agricultural production- differ from the other types of open spaces in design, social, regulative, and economic structures as well as uses, they also have other features in common. Beyond their enclosed environment which is different to an urban open space, their spatial and design qualities are based on the same principles.

The Persian garden represents the distinctive features of productive landscapes (historical landscape characteristics). Surveying the Persian Gardens demonstrates that the features of the productive landscapes could be categorized into three distinct groups of attributes:

- *Landscape personality*
- *Landscape identity*

- *Landscape accessibility*

Concerning the fact that the Persian gardens can have dual or multiple functions as sources of income and pleasure, they are seen as a reliable spatial-physical reference for discovering the criteria of designing the multiple-functioned landscapes and open spaces. Based on the field studies and analytical-descriptive methods as noted in chapter five, three first hand and fundamental characteristics of the Persian edible landscaping are introduced, which can be the characters of the urban agricultural phenomena in future urban agricultural landscape planning and design. In fact, the author tries to fill the significant gap by introducing the principle of creating the edible landscape for landscape architecture as well as environmental design engineers.

As mentioned previously, these principles are landscape personality, landscape identity, and landscape accessibility, which are the three major characteristics of the utilitarian green spaces which are embedded in the Persian garden's spatial and physical system. The distinctive features of agricultural landscape personality differ from the ornamentals with permanent-large-continues planting spaces, independent and specific functions, separate and different plant species, permanent plant elements, specific planting design, distinct management and maintenance operations, and its distinguishable environmental design. The landscape identity of the utilitarian agriculture in Persian gardens consists of cultural identity, climate identity, and contextual identity. Furthermore, Persian gardens demonstrate the hierarchical access to productive greenery and edible yields which are found in the accessibility strategies which go from full physical access to the complete interruption visual continuity. Interestingly, the access management to the edibles is conducted through spatial planning and creative environmental design.

Therefore, these particular features show the significance of historical green spaces by introducing the criteria of agricultural landscape planning and design. Specifying this point of view in which designing the farm landscape and urban agricultural phenomena are not only using the fruitful green elements, but rather the landscape personality, landscape identity, and landscape accessibility which compose the backbone of planning and designing the productive landscape structure.

Another point of view would be the principles of integrating the agricultural and pleasure greeneries in Persian garden. The landscape architectural principles of integration based on the Persian garden are these:

- ***The principle of physical separation:*** separation of productive space and recreational space from each other which means the decorative landscaping and agricultural greenery should be physically separated from each other.
- ***The principle of visual integration:*** the visual and aesthetic combination of two abovementioned types of plant systems in the eye of the spectator, emphasizes the integrated identity of the garden.
- ***The principle of spatial continuity:*** points out the necessity of continued integration of the productive-decorative scenery in the length and width of the garden. This policy focuses on the continuation of both the physical separation and visual integration in length and width of the built environment. Following on this principle the two previous principles should be extended in the longitude and latitude of the space and their application should not be limited to some spots.
- ***The principle of access management:*** which takes into consideration that the access points to the agricultural fields are designed so that they don't disrupt the visual continuity of the garden. High structural plants (trees) can impede visual connection within the agricultural spaces as well as view fruits beyond; the crop's and fruit trees volume and compactness define productive spatial units. On the other hand, for the visitor or gardener who enters into the agricultural zones, connectivity, however, goes beyond the visual. Physical links define the accessibility of the productive open spaces and visitor.

The subsequent tables show the detail information of 12 historical gardens which are located in Birjand city region in East of Iran. The information which have been gathered of Birjand's Historic Garden Database shows the information of location, area, services, agricultural products, and the conservation status.

## **Future direction**

Mutual benefits can be achieved if agricultural integration is acknowledged and respected as a key factor and resource in the revitalization of urban gardens. The examples discussed in the Urban



Agriculture Europe (Lohrberg, et al. 2016) show that urban agriculture can play an active role in the conservation and transformation of agricultural heritage-tangible and intangible, outstanding and every day- and at the same time meet the actual needs of the people. Food gardening and farming can establish a band between the former and future functions, and can add the role of food production to the open cultural spaces as well as new services to the historic buildings. A relevant strategy would be the establishment of new allotment gardens in former agricultural or gardening sites, such as the allotment gardens in Badalona, in the Barcelona Metropolitan Area (Lička & Maldonado, 2016).

Iranians can reuse the built heritage for school workshops and take care of the agricultural fields by introducing allotment gardens and educational gardens for children and adults. Urban gardens can create a recognizable urban landscape because they are enclosed and walled spaces, but for the citizens, the use of urban spaces is not yet provided. They vary in size, but their shape follows Persian garden design, structurally, functionally, and visually. From the viewpoint of scale, most of the urban historical gardens are medium-scale areas, so, their size is equated to the allotment or community gardens, and in this respect they may comprise a pattern of combined individual plots. But the facilities related to agriculture, such as farmers' market, the local food restaurant, the community garden, and gardening and agricultural workshops for adults and children should be organized through the possibilities which are offered by the Persian gardens.

Old and deteriorated gardens can also implement urban agriculture. Vacant or abandoned garden spaces which are not productive or profitable are appreciated for civic society to defend them from demolition or consumption by urban sprawl and retrieve them into productive and multifunctional spaces, reusing and revaluing spatial qualities and landscape features. Also, in active gardens which are tourist destinations and attractions in cities, there are abandoned areas of former agricultural and gardening areas. These vacant lands are situated inside the cultural heritage, and through the involvement of the people and gardening, these areas can be converted into a vivid semi-public area with new functions and visions.

Garden name	Size (ha)	Agricultural size (ha)	Location	Land tenure	Services	Agricultural products	Full time employee	Part-time workers	registration	Persian garden structure
Akbariyeh	3.5	2.5	I	endowment	TR, E, A	F, S	5	10	W, N, E, R	yes
Amirabad	9	8	P	government	TR, E, A	F, S	8	15	N, R	yes
Bahlgerd	5.5	4	O	endowment	TR, A	F	2	6	N, R, E	yes
Hoseinabad	3	2.5	O	private	R, A	F	4	0	N, R	yes
Rahimabad	2.2	1.8	I	government	TR, E	F, S	3	10	N, R	yes
Seydabad	8	4	O	government	TR, A	F	2	0	N, R	yes
Shokatabad	8.5	8	P	endowment	TR, A	F	6	6	N, R, E	yes
Aliabad	6	3.5	O	private	R, A	-	1	0	N, R	yes
Golshan	8	7	I	endowment	TR, A	F, V, S	8	10	N, R, E	yes
Masoumieh	7	6.5	T	private	A	F	3	6	N, R	yes
Manzariyeh	3	2.2	P	private	A	F, M	4	0	N, R	yes
Mood	7.5	6	O	private	A	F	2	3	N, R	yes

**Services:**

TR: Tourism & Recreational  
E: Educational  
A: Agricultural  
R: Residential

**Agricultural products:**

F: Fruits  
S: Sapling  
V: Vegetables  
M: Medicinal

**Registration:**

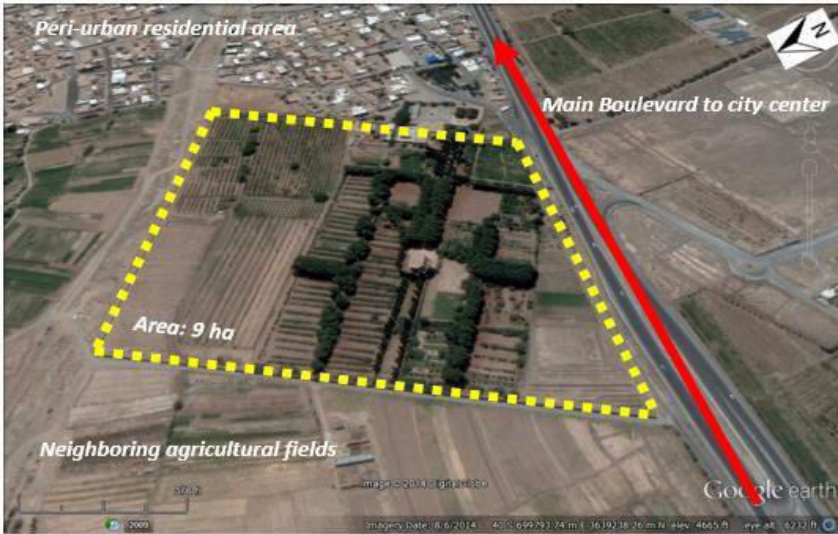
W: World Heritage  
N: National Heritage  
E: Endowment  
R: Legal registered

**Location:**

I: Intra-urban  
T: Trans-urban  
P: Peri-urban  
O: Outer-urban

*Table 30. An overview into 12 Persian gardens, size, location, services, ownership, products, entrepreneurship, and registration status.*

*Figure 74. Amir Abad peri-urban garden and its tangible monuments and green elements*



**History:** 18<sup>th</sup> century

**Landscape type:** original Persian garden

Ownership: government

Distance to city center: 8 kilometer

**Current application:** historical-educational garden

**Area:** 9 hectare

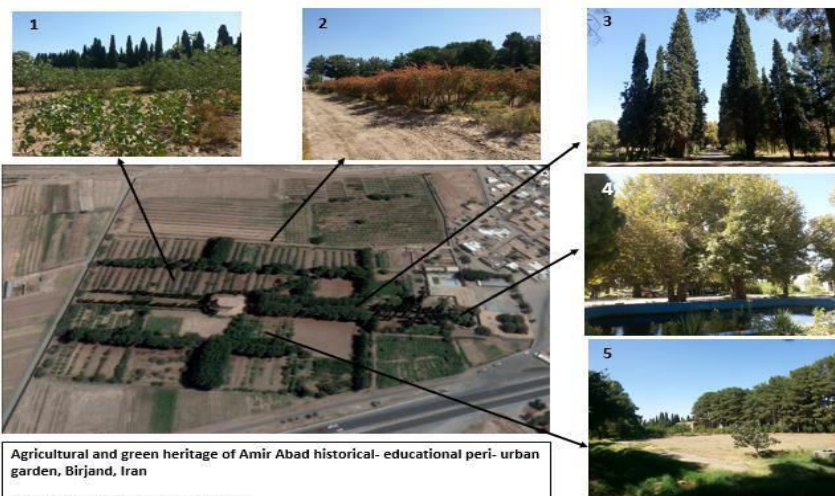
Area of agricultural fields: 8 hectare

Number of engaged people: 40

**Agricultural products:** pistachio, grape, apricot, pomegranate

**Tangible historical monuments:** mansion, wall, entrance, buildings

**Tangible historical plants:** pine, cypress, fructiferous



Agricultural and green heritage of Amir Abad historical- educational peri- urban garden, Birjand, Iran

- 1: creation the agricultural landscape
- 2: visual integrating ornamental trees and productive trees
- 3: Strong image by spatial elements and tree malls
- 4: Creation of areas and zones for recreation
- 5: vacant former agricultural zones



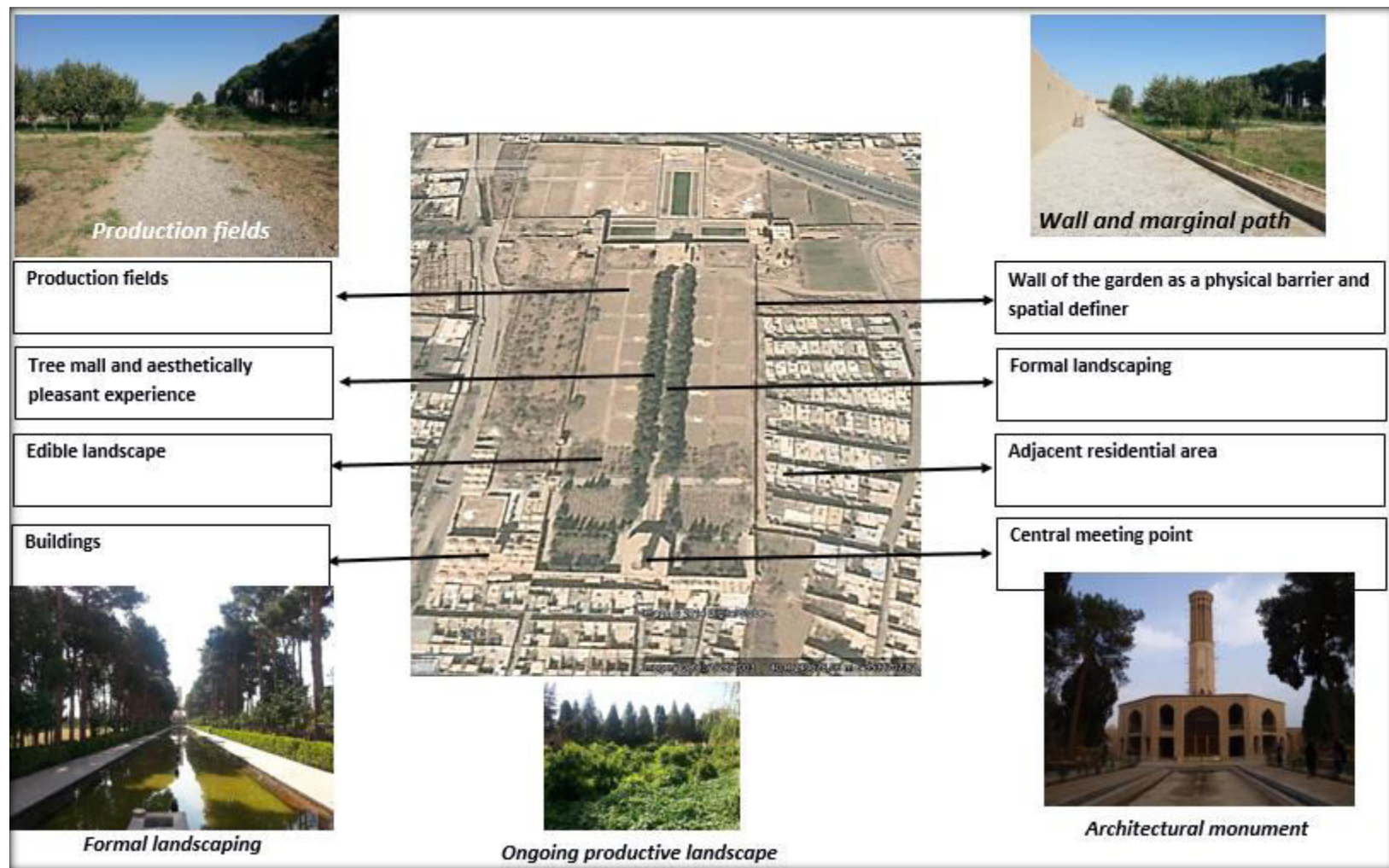


Figure 75. Appropriateness the heritages of Dolat-Abad garden for development the urban agriculture

## **Integration urban historical gardens into Continues Productive Urban Landscapes (CPULs)**

In Iranian city context, there are urban gardens that represent important parts of urban landscapes and make significant contributions to green infrastructure. Most of the remnant gardens were not yet originally conceived as urban areas or urban open spaces but have gradually become an essential part of the urban green infrastructure. Some of these remnant gardens are active, some are inactive, and some of them do not offer enough specific features of Iranian gardening design. But based on their setting in urban areas, they are potential urban agricultural open spaces.

On the other hand, Persian gardens which have the distinctive feature of Iranian gardening, as well as being registered as the cultural landscape are another potential area for urban agriculture which should spatially be connected to other urban functions and elements, thus to infrastructure of mobility, and possibly also to landscape elements such as recreational lawns, and public parks. All of these features should be designed to provide the best conditions for cohabitation of different uses within the city.

While urban gardens in the inner city are located in smaller and dispersed plots, they can consist of massive patches of arable fields, orchards, or vineyards when located on the fringe of the city or in peri-urban areas. The location of urban gardens as form occurs both in intra-urban fabric, as well as in a trans-urban location. In Birjand city (in the East of Iran, near to the border between Iran and Afghanistan) urban gardens do not constitute the significant part of the open urban landscape and thus, do not come from a green wedge or green belts, rather they are individual intra-urban and trans-urban spots.

It is advisable that the place-making strategy of urban gardens for green infrastructure. The policy decision to place Iranian edible landscape on green infrastructure is a significant step for the concept's success. This strategy has established a relationship between green infrastructure and Persian's garden, agricultural images in the urban region. It is for redesigning the streetscape and revitalizing urban parks based on traditional productive landscape features in Persian gardens. On the other hand, 'Place-making here is defined as a collective process of spatial designing with the

objective of improving the land use and the quality of life and to socioemotionally ‘appropriate’ space’ (Fürst et al., 2008: 73 as cited in Timpe et al., 2016: 129).

Continuous Productive Urban Landscape (CPUL) is a design concept advocating the coherent introduction of interlinked productive landscapes into cities as an essential element of sustainable urban infrastructure. Central to the CPUL concept is the creation of multi-functional open urban space networks that complement and support the built environment. Based on the CPUL concept, green corridors provide a continuous network of productive open space containing footpaths and cycle ways. Fields for urban agriculture and other outdoor work and leisure activities are located within the network and serve adjacent built-up areas. Its network connects existing urban open spaces, maintaining and, in some cases, modifying their current uses (Viljoen, 2011).

Considering the role of Persian garden in Iranian city, a CPUL proposal can connect a historic public garden, the modern park, the green spaces, the pedestrians, the semi-public open spaces of the university and schools in the central city to the agricultural and natural resources at the edge of the city. It can be imagined how parts of modern parks may be given over to productive landscapes including urban agriculture and selected roads be “greened” without compromising other uses. In this proposal, the roads and streetscapes, which is lightly used by vehicles, would be converted into an urban agricultural field surrounded by cycle and pedestrian ways. Concepts like Continuous Productive Urban Landscapes (CPULs) provides design strategies capable of giving spatial and organizational coherence to the infrastructural and qualitative aspects of urban agriculture.

In fact, the CPULs concept would be a basis for connecting the Persian historical gardens locating in urban settings with the other open spaces; physically and principally. The pattern of presenting the historical gardens in an urban context is a patch, and interestingly, by physical connecting the gardens as the productive landscape into infrastructure, the network of the productive landscape will be created. In addition to the physical interlinking the garden and urban open spaces, there is the distinct principle of Iranian edible landscaping which can be transferred and exported from the garden on continues network of a productive landscape. In fact, by applying the CPULs concept in the case of historical Persian gardens, the garden will be the starting and

focal point of a continuous network of productive open space while the Iranian principle of designing the productive landscape will be applied to developing the coherent green network.

The historical garden has a stable and definite structure, but astonishingly, has the potentiality to be embedded into the contemporary landscape planning concept, such as CPULs. For example, in the real way of connecting several Persian gardens to each other, there would be public parks, streetscapes, green spaces, and remnant gardens which can be revitalized, redesigned, and rehabilitated by applying the Persian garden landscape principle on them. Thus, CPULs concept can be a tool for physical and principal connection to be built a coherent network of a productive landscape. Meanwhile, the old green spaces consist of exotic, unattractive, and limited plant species can be redesigned based on traditional edible landscaping on a modern landscape planning tool. It would result exporting the traditional green space design from the historic gardens to the urban open spaces based on the current approach to urban agriculture.

In conclusion, it would be possible to be reinforced the urban agriculture identity of the Iranian city by extending the patch shape gardens in urban setting into the network-shape productive landscape which the historical gardens are the hub of culture and cultivation. That network connects the historical garden, public parks, greeneries, while its physical and spatial design imports from the Iranian edible landscapes which shape the Persian garden integrative landscape, and have been mentioned in the previous chapter of this thesis.

### **Persian gardens as a successful public space; potentials for public engagement, urban agriculture education and extension of the relevant skills and methods**

Gardens and gardening activities may offer a critical site of comfort and a vital opportunity for an individual's emotional, physical and spiritual renewal. One motivation for considering the Persian gardens as the start point for developments in the urban agriculture in its Iranian context is the role traditional Persian gardens play for the health status of urban residents. The scholars have proved the health outcomes of urban agricultural activities and engagement. The benefits of gardening and engaging with urban agriculture can be categorized into physical health and community development. The former as a result of consumption of organic produce and the latter

by improving community relations (Armstrong, 2000). It is also proved that the community garden contributes to individual, household, and community food security (Corrigan, 2011).

The other aspect of the relationship between health and urban agriculture is building the healthy community by strengthening the social and behavioral communication through agricultural production procedure in relevant spaces. Thus, the sense of achievement, satisfaction and aesthetic pleasure that people can gain from their gardening activity (Milligan, Gatrell, & Bingley, 2004) would be translated to the promotion of health. However, communal gardening on allotment sites creates included spaces in which people benefit from gardening activities in a mutually supportive environment that combat social isolation and contributes to the development of their social networks. By enhancing the quality of life and emotional well-being of older people, communal gardening sites offer one practical way in which it may be possible to develop a 'therapeutic landscape' (Milligan et al., 2004). In developed and prosperous countries the second aspect of urban gardening gains more attention because of its effects on social connections, reciprocity, mutual trust, collective decision-making, civic engagement and community building which can be fostered by community gardens through key activities such as volunteerism, leadership, neighborhood activities and recruitment (Teig et al., 2009). Therefore, urban gardening can be beneficial for both the social aspects of the neighborhood as well as the health of individuals (Comstock et al., 2010).

The other aspect of promoting the health of urban residents is visiting the historical gardens in which the visitors do not engage in agricultural activities. The Persian gardens are multifunctional spaces, but many of them have not yet been provided with the urban gardening for the public society. These historical Persian gardens as Iranian urban green spaces are still actively used by urban residents and their importance for inhabitants' health status, and wellbeing has been addressed. The findings of Rostami, Lamit, Khoshnava, & Rostami (2014) suggest that historical Persian gardens are public places that play an integral part in the residents' identity and health. The gardens do not just represent physical spaces; rather, they represent the interconnected physical, symbolic, spiritual, and social aspects of citizens' cultures. Gardens can fulfill the psychological needs of contemporary urban residents. But since the urban dwellers considered them as recreational areas, places for relaxing, and places to escape from daily concerns, which are essential



ingredients of well-being, the agricultural activities which could reinforce the public health and help the development of the community, have been ignored.

For these purposes, the natural elements of gardens have a remarkable role. Fulfillment of urban agricultural functions besides the psychological needs of citizens would make these gardens valuable municipal resources that could – beyond preparing the permanent physical space for urban gardening – also improve the planning and designing of contemporary urban green spaces in Iran. These gardens could be considered as bridging previous garden works with future green spaces designs to create places for self- discovery and social connections (Rostami et al., 2014).

Another significant attribute of Persian gardens is that the research suggests that the historical Persian gardens are successful public places due to their historical, natural, functional and emotional aspects (Rostami et al., 2016). Current experiences also engage the visitors emotionally to the gardens, so that feelings such as calmness and tranquility, happiness, comfort, safety, freedom and even health are frequently mentioned by respondents while experiencing the gardens. Concerning our point of view of historical Persian gardens as urban natural spaces which fulfill many social functions and psychological needs for citizens, the missing approach is tangible and intangible agricultural heritages. ‘Natural diversity and coherent and historical aspects of the gardens afford residents the opportunity to recognize the gardens as a unique place that they are attached to and depend on. The engagement of citizens with the gardens and the multiplicity of experiences lead to the creation of deeper meanings and values that distinguish gardens from one side, and the other hand leads to a functional and emotional attachment that evokes a sense of place and identity’ (Rostami et al., 2016). Therefore, involving the urban residents in agricultural activities of the historical Persian gardens and public engagement with the tangible and intangible heritages even can promote the conservation and protection of the gardens by entrepreneurship, developing the community building, improving the health; physically, and socially.

## **Discussion**

In many cities areas of urban agriculture have developed from the countryside enclosed by expanding and sprawling city. Within the city, the areas and plots with agricultural use were usually changed to the other functions, such as housing, transport, and recreation.

Today, some of this remnant agricultural landscape are Persian gardens with its historical value and tie the agricultural production closely to cultural heritage issue. ‘Urban agriculture is renewing the historical link between culture and cultivation’ (Lička & Maldonado, 2016: 116), and therefore, ‘to maintain urban agriculture, permanent and functional access has to be provided’ (Paradis, et al., 2016: 120). This statement for Iran’s case means social accessibility and their functions for operating the gardening affairs. Because the gray infrastructure, and housing is in proximity of the gardens. But the Persian gardens are only providing the recreational or in a rare case, some educational services, and the public engagement has not yet been provided.

Nowadays, the Iranian historical urban gardens are in many cases publicly accessible open space, allowing users to interact and enhancing social inclusion. But not as an urban farmer or gardener, just as a visitor who visits the other types of urban public spaces. Thus, the potentials of urban agricultural opportunities of Persian gardens have not yet been harvested.

Thanks to the wide range of spatial and landscape characters provided by urban historical gardens, these spaces have the significant potentials to acquire the benefits of development the urban agricultural phenomena in them (subsequent table). This aim will need to be promoted the landscape protection, quality, management, and planning. Indeed, these gardens are the best wealth to fight against the standardization and homogenization of urban landscape in Iranian cities, acknowledging that the garden can be contributed to the formation of local cultures as well as locally identified landscapes if they recognize as the fundamental component of the cultural and natural heritage of Iranian cities.

The structure of these gardens is consist of an enclosed and walled open spaces. So, the private gardens are only privately accessible, but in many cases, the door is available to the public. But the public access can be restricted to a particular area.

In conclusion, this research proposes two main strategies for integration the urban agriculture into the Iranian city and landscape by emphasizing the role of Persian historical gardens which are now located in Intra- or peri-urban settings. These include involving strategies and place-making strategies.

Table 31. Benefits Persian garden can bring to urban agriculture (drafted based on Timpe et al., 2016: 127)

<i>Ecosystem services benefits group</i>	<i>Urban agriculture benefits</i>	<i>Possible contribution of Persian garden</i>	<i>Especially relevant urban agriculture types</i>
<b><i>Provisioning services</i></b>	Multifunctional lands and spaces	Providing land, space, building, and food	Local historical gardens
	Investment and employment	Employment and investment in conservation or revitalization the agricultural attributes of the historical gardens	All urban abandoned or vivid gardens
<b><i>Cultural services</i></b>	Tourism and recreation	Broad range of recreational activities in historical gardens as a destination	Tourist gardens, World Heritage gardens, National Heritage gardens
	Education	Garden as a teaching resource and ‘natural laboratory’	Educational gardens, cultural heritage gardens
	Health and well-being	Gardening as activities for physical and mental health, access to healthy food	Private urban gardens, educational gardens, cultural heritage gardens
	Iranian gardening extension	Preparing a traditional and local framework and principles for designing the edible landscape	All Persian gardens
<b><i>Regulation services</i></b>	Enhance efficiency of natural resources	Maintenance of garden soil fertility	All historical and urban gardens
	Climate change mitigation and adaption	Cooling effect of garden greeneries, carbon storage	All historical and urban gardens
	Water management	Groundwater recharge and purification	All historical and urban gardens
	Land and soil management	Reduction of soil erosion, increasing soil fertility, mitigating land consumption	All historical and urban gardens
	Disaster prevention	Erosion control	All historical and urban gardens
<b><i>Habitat</i></b>	Conservation benefits	Maintenance of agrobiodiversity and garden habitat	Cultural heritage gardens, historical vivid gardens
	Low-carbon transport and energy	Short chain food provision	Intra and peri- urban gardens

## **Public involving strategies**

Persian gardens are the places where cultural and agricultural heritages and activities coexist in urban or peri-urban areas. These gardens are the cultural landscape and heritage and are thereby protected by law. Buildings are being restored and their use changed into cultural centers, museums, and historical archive centers or used as education and artist training centers. Lines and networks of old trees and square-shaped plots structure the landscape, and the buildings are made with traditional materials and techniques, which have constantly been adapted- and along with practical knowledge passed on for generations.

‘The development of urban farms in these areas [landscape heritage] allows preservation of the landscape and heritage value. It is recognized by people and meaningful for their identification with the landscape. Many types of urban agriculture can benefit from beauty and added value of cultural heritage, especially if the aim is to embrace social and cultural functions’ (Branduini et al., 2016: 142)

In Iran, contrary to the desire to preserve historic buildings and landscapes, the intention to maintain or reintroduce the agricultural functions is not high. Buildings and walls surround some historical gardens without agricultural land and production. Since ‘availability and access to productive land as ensured by planning tool and decisions are crucial for urban agriculture’ (Paradis et al., 2016: 123) the program for productive open spaces of these gardens should be promoted by educational farm, farmers’ market, and food gardeners.

In historical agrarian morphology and structure, the particular cultural significance goes beyond the type of cultivation (crops, fruits, vegetables). Many local types of urban farming and food gardening continue to use traditional agricultural methods and take advantage of the cultural significance of their place. This continuity helps to raise public awareness of the value of agriculture and the importance of cultural heritage. On the other hand, heritage features or historical and scenic values often appeal to many citizens and thus create additional benefits for urban agriculture (Lička & Maldonado, 2016).

Some associations can be started to buy old gardens, to preserve or retrieve the farming and gardening activity in a more sustainable and profitable way. While in the current situation, urban

gardens are integrated with some social functions- such as leisure or direct selling- they should be promoted, and the stakeholders should be encouraged to organize gardens socially.

It should not be underestimated that the urban agriculture in Europe proves cultural heritage and urban agriculture mutually improve and enhance each other (Lohrberg, et al. 2016). Therefore, involving the public in gardening and farming by performing cultural services for society can maintain the traditional cultural landscapes and their components, crop varieties, and cultivation techniques and transmit customs and traditions. Another aspect of involving the inhabitants is providing the basis for educational activities which guarantee the transmission of the cultural values of the agricultural site (Brandaini, 2015).

Thanks to the structure and spatial designing of the Persian gardens, as mentioned previously, there are distinctive principles of integration for the productive and ornamental open spaces, which involve the inhabitants will not disturb the current recreational and official uses. But even more, providing the possibilities for public engagement will guarantee the conservation of the other current utilizations, due to moving the garden from the marginal spaces in the heart of citizens living, working, education, training, and feeding environment.

### **Place-making strategies**

“The idea of a man using nature reappears and our landscape can no longer be reduced to ‘scenery’ that requiring a conservationist approach” (Timpe et al., 2016: 126). To meet this challenge we have to replace the single-purpose land uses with a model of multifunctionality. ‘In an integrated vision of the landscape, respecting its productive output as well as its social and ecological functions, agriculture has a major role to play’ (ibid). While the role of agriculture in open space maintenance was neglected in the past, the current strategy has to put it on the agenda, and therefore, urban agriculture will be the next innovation in dealing with urban landscapes (Timpe, Kemper & Pölling, 2016).

Often, agricultural heritage features are still visible in Intra- and peri-urban areas of Iranian cities in the shape of historical gardens close to the dense urban fabric forming a cultural landscape. The Persian garden’s productive landscape is a very characteristic element of the gardens. The principle and criteria of agriculture’s productive landscape design have not yet been implemented

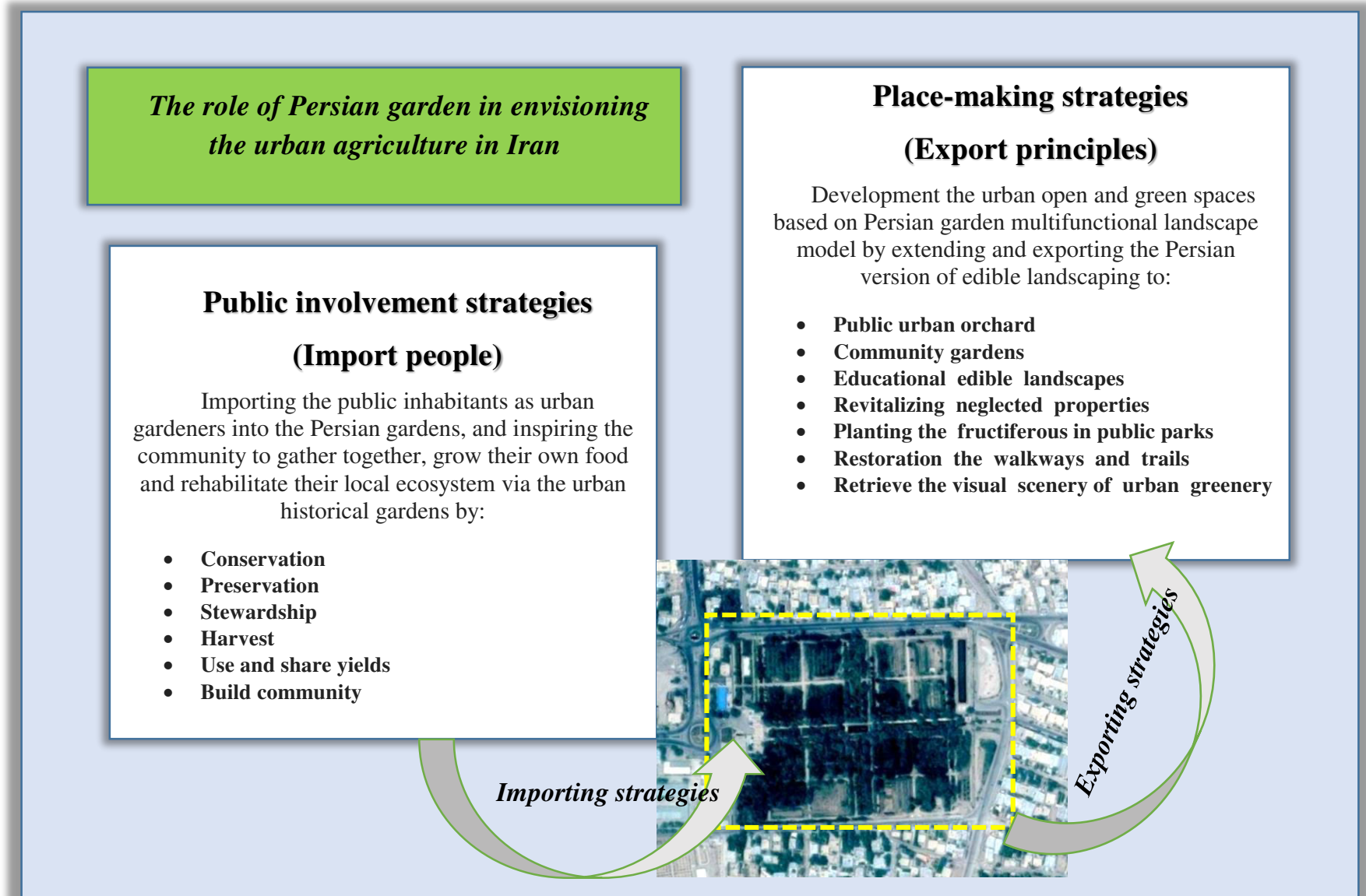
on green infrastructure. Now it should be oriented towards the urban system on the one hand, and on the contrary, the citizens should be accepted in the gardens, not only as the visitors enjoying the scenery for human leisure, but also as the gardener, producer, and urban farmer. Reaching this goal requires appropriate design and management strategies.

From the perspective of place-making strategies, Persian gardens are supposed to act as the base layer for redesigning urban parks. In this way redesigning and creating urban parks will include agriculture based on the principles of the Persian gardens spatial organization (transforming the spaces). The need for sustainable food security on the one hand, and the desire for green spaces and a clean environment, on the contrary, have become important aspects of the agricultural area in the urban landscape. It makes agriculture a valuable land use in the urban fabric and an integral part of spatial planning systems. Also, ‘maintaining and developing urban green spaces with an economical, here agricultural, the claim is more suitable than consuming limited public budgets taking care of green spaces’ (Pölling et al. 2016).

The Iranian cities green and public spaces are disconnected from the Persian garden features, activities, and applications (e.g., multifunctionality, and the experience of agriculture). In a city, from those experiences that make urban greeneries attractive, delicious and edible. These eroded parks also disconnected from their city’s surroundings (agro-geographical context). In the new approach, we desire to give the citizens as well as tourists a new vantage point to observe and connect with their agro-geographical context.

In my opinion, the strategies that have been pursued in designing the productive landscape of Persian gardens can be generalized and transferred to the other open spaces. They have been introduced previously in chapter five and six (landscape personality, landscape identity, landscape accessibility; the principle of separation, the principle of combination, and the principle of accessibility). These distinctive features and landscape architectural principles will become individual through how they are applied to an actual location. They form a toolkit for successful edible landscape design on both a creative and programmatic level. The challenge is applying these tools to the particular situation and context.

Figure 76. The role of Persian garden in envisioning the urban agriculture in Iran



## **Interim conclusion**

Historical Persian gardens are the first examples of Iranian green spaces that have established a complicated relationship with the cities and become part of public spaces from the 11<sup>th</sup> century until now and are still being used actively by urban dwellers. Gardens are places of being together and living together which could enhance people's physical, social, and cognitive functions and increase their sense of attachment to their town and society, consequently increasing society's health status and well-being.

Nowadays, these gardens from the pathological perspective struggle with some issues such as the elimination of the edible landscape, not involving the public in planning and maintenance, neither engaging the citizens in the agricultural activities. On the other hand, the public parks and green spaces have particular problems, such as one-dimensional planning and planting, homogenization, high-consumed styles, and not permitting the cities' inhabitants to initiate the agricultural production in the urban open spaces, while the people also struggle with unemployment, inactive lifestyle, and living in small apartments without adequate green spaces allocated per capita. Some try to preserve and protect the fructiferous of the previous site as a picture of past landscape, cultural or productive landscape, but they have not yet provided gardens for social and fruitful activities.

Conservative approaches through the rules and regulations which aim at defining and protecting the urban historical gardens as the permanent and long-term land uses, do not guarantee farming activity. Even though land preservation in master plans and another planning tool is necessary, it will not guarantee agricultural activity over time. While garden's landscape is regarded as the scenery for human leisure and garden's nature preserved as existing only as the resources for outdoor recreational services, a strong tendency is the diversification of production and services. The geometric parceling of uniformed plots, as well as the variety of local fruit, vegetables, and ornamental plants provide a high scenic quality, but the society requires to plan and program these gardens based on more than recreational resources.

Thanks to the structure and spatial designing of the Persian gardens, as mentioned previously, there are distinctive principles of integration for the productive and ornamental open spaces, which involve the inhabitants will not disturb the current recreational and official uses. But even more,



providing the possibilities for public engagement will guarantee the conservation of the other current utilizations, due to moving the garden from the marginal spaces in the heart of citizens living, working, education, training, and feeding environment.

On the other hand, the principles and criteria of agriculture's productive landscape design have not yet been gone on green infrastructure to shape the integral agricultural and productive landscape. From the perspective of place-making strategies, Persian gardens are supposed to act as the base layer for redesigning urban parks. In this way redesigning and creating urban parks will include agriculture based on the principles of the Persian gardens spatial organization (transforming the spaces). Persian garden would find a new role in Iranian cities beyond being a cultural landscape and tourist attractive site, and that is its significant role in envisioning the urban agriculture in particular Iranian context through:

- Providing the traditional and distinctive features of the productive landscape:
  - Landscape Personality
  - Landscape Identity
  - Landscape Accessibility
- Presenting the local version of principles of designing the integrative landscape:
  - Principle of physical separation
  - Principle of visual combination
  - Principle of spatial continuity
  - Principle of hierarchical accessibility
- Potentiality for involving the urban residents into agricultural activities
- Appropriate architectural principles of designing the Iranian edible landscape for transferring it into the urban green infrastructure
- Disseminating as the cultural heritage and cultural landscape
- Historical places of a tie between culture and cultivation.



## Chapter 9 : Conclusions

This research started with this question that ‘which roles can be designated for the Persian garden in envisioning the urban agriculture in Iranian cities and landscape?’

Concerning the fact that the Persian gardens can have dual or multiple functions as sources of income and pleasure, introduces them as a reliable spatial-physical reference for discovering the criteria of designing the multiple-functioned landscapes and open spaces.

We analyzed the foundations, characteristics, and distinctive features of productive landscape in Persian garden, and recognized the principles of integration the agriculture and pleasure greeneries in the structure of the gardens. Based on the new theories that try to integrate agriculture into public green and open spaces, the advantages and features of the Iranian edible landscaping are applicable in the scale of urban agriculture planning. But in Iran, due to the ignorance of the application and benefits of edible-bearing plants in open and green spaces, a lot of environmental quality of the landscape which could be more attractive and more efficient have been lost. Even in Birjand city where in addition to Akbariyeh garden that is rated as a UNESCO World Heritage, has dozens of other valuable historical gardens, there is not the systemic integration of the fruitful greenery in planning and designing of green spaces and parks. Whereas, the recent studies and multidimensional characteristics of the agricultural landscape in the Persian gardens are focused on the integration of edible plants in urban landscapes.

The results of this research show that the issue of the productive landscape beyond the elements of productive plants, reveals the complexities, correlations, and dependencies in the planning and design of Persian gardens. Therefore, the functions of edible landscaping are not limited to agriculture and fruit production or to creating the visual green sceneries. In fact, the edible and agricultural greenery in Persian gardens is the multi-functional landscape which beyond entrepreneurship and supplying self-sufficiency, its scenery works as the outdoor recreation resources and remedial landscape, as well as its ecological attributes by taking into consideration the adaptation and sustainability of the built environment to the climate condition in order to produce the optimum outputs. Therefore, the protection of the edible landscapes in Persian gardens needs the systematic re-look to recreate the garden and its cultural environmental contexts.

In this thesis for recognition the role of historical gardens for urban agriculture development, we try to analyze the structures and features of productive landscape from five viewpoints:

- Foundations and characteristics of productive landscapes in traditional gardens,
- Hierarchical access to the edible landscape, access management, and the possibility of extension those policies into the urban landscapes,
- Distinctive features of agricultural green spaces,
- Principles of integration the fructiferous and ornamental plants, and
- Assessment the Persian garden capacities to accommodating the progressive urban agriculture phenomena.

We analyzed the accessibility to the edible landscape in several Persian gardens and found that Iranian garden designers, beyond the landscaping and creating diverse sceneries, have provided diverse patterns of spectator-scenery connectedness that could open the new windows in edible landscaping discipline. Because, the visitor connectedness to the edible and inedible plants inside the Persian gardens is different. All of our case studies in which the original planting system had been conserved, shows a distinct differentiation between the spectator accessibility to the agricultural fields and the connectedness to the pleasure scenes. Our investigations demonstrate that the policies of spectator-scenery relationship in different gardens are a result of the original function of the garden. In other words, each garden has been created for some specific and multilateral intention. The specific intentions make the different strategy of the visitor- greenery accessibility from the viewpoint of the connectedness to the edible and inedible green spaces. Moreover and based on those findings, we proposed some specific codes and rules for landscape architects in the end of chapter four.

On the other hand, the simultaneous use of gardens as places for relaxation, administrative meetings, and ceremonies, makes them an appropriate model to determine the specific codes and rules to integrate the edibles into the landscapes. As a principle, the restorative use of the parks and landscapes would not be conflicted with their productive function. Although, it will be

anticipated that the economic products in public spaces will only be used by the members of the initiative community, family or practitioners, or as the municipal gifts to guests visiting the spaces.

While the integration of edible plants under the particular system named urban agriculture into landscapes and open spaces is being encouraged by some of the designers, the deficiency is recognizable principles, patterns, and concepts for landscape designers. We studied the Iran's historical gardens to derive some determined ideas and designs. Furthermore, the diverse accessibility patterns in different Persian gardens can be utilized as the concepts for designers who try to integrate edible plants into open spaces.

In chapter five, three first hand and fundamental characteristics of the Persian edible landscaping were introduced, which can be the characters of the urban agricultural phenomena in future urban agricultural landscape planning and design. In fact, the author tries to fill the significant gap in the introduction the principle of creating the edible landscape for landscape architecture as well as environmental design engineers.

As mentioned previously, these principles are landscape personality, landscape identity, and landscape accessibility, which are the three major characteristics of the utilitarian green spaces, and embedded in the Persian garden's spatial and physical system. The distinctive features of agricultural landscape personality differ from the ornamentals with permanent-large-continues planting spaces, independent and specific functions, separate and different plant species, permanent plant elements, specific planting design, distinct management and maintenance operations, and its distinguishable environmental design. The landscape identity of the utilitarian agriculture in Persian gardens consists of cultural identity, climate identity, and contextual identity. Furthermore, Persian gardens demonstrate the hierarchical access to productive greenery and edible yields which the accessibility strategies consist of the range of full physical access to the complete interruption visual continuity. Interestingly, the access management to the edibles is conducted through spatial planning and creative environmental design.

Furthermore, based on the results of this study, designing the agricultural landscape and urban agricultural phenomena is not only using the fruitful green elements, but rather the landscape personality, landscape identity, and landscape accessibility composes the backbone of planning and designing the productive landscape structure.

In chapter six, we surveyed the historical gardens of Iran to discover and introduce the principles of integration the fruitful and ornamental plant elements in the structure of the historical green spaces. The aim was to introduce the indigenous and local principles for the landscape architects and environmental designers to have a foundation on which base their design of the urban agriculture landscape. These landscape architectural principles of integration based on the Persian garden are these: principle of separation (the separation of productive space and recreational zone from each other which means the decorative landscaping and agricultural greenery should be physically separated from each other), principle of integration (the visual aesthetic combination of two types of plant system in the eye of the spectator, and emphasizes on the integrative identity of the garden), principle of continuity (tells the two previous principles should be continued in the longitude and latitude of the space and their application should not be limited to some spots), and principle of access management (which takes into consideration that there are some access strategies to the agricultural fields and fruits).

Having a toolkit of principles of integration the agriculture landscape into the open spaces development can be a significant challenge for landscape designers. This study showed that the historical landscapes and gardens can provide the local and traditional criteria of planning and design the integrative landscape consisting of edible and non-edible plants. At first, the agriculture and pleasure zones must physically be separated, but composing their visual appearances will promote the aesthetics of the green scenery. Thus, the illustrative approach into urban agriculture landscape should not be underestimated. The third aspect is the importance of continuity the physical separation and visual composition across the land, and not limiting their application into some spots. At lost but not the least, the accessibility rule tells about the hierarchical access to the edibles by access management the visitors through application the environmental design innovations.

In chapter seven, we found that the Persian garden with having the appropriate design, structure, and elements could be introduced for accommodating the collective urban agricultural phenomena. In this new perspective, the attractiveness of historic garden encourages the urban agriculture which will be supported in that place by the historic elements of the garden, the opportunity to produce agricultural goods together with other people, or simply consume products from a well-

known landscape heritage. Therefore, we proposed two main strategies which are critical for development the UA in Iran:

- **Placemaking strategy:** the spatial and environmental design of Persian garden can be introduced as a model and reference for designing the new urban agriculture landscapes.
- **Public-involvement strategy:** getting involved the urban inhabitants for reprogramming the remnant historical gardens for accommodating the edible public greenery.

In chapter eight, we explained that the historical Persian gardens from the pathological perspective struggle with some issues such as the elimination of the edible landscape, not involving the public in planning and maintenance, neither engaging the citizens in the agricultural activities, nor in revitalization the old gardens' productivity. On the other hand, the public parks and green spaces have particular problems, such as one-dimensional planning and planting, homogenization, high-consumed styles, and not permitting the cities' inhabitants to initiate the agricultural production in the urban open spaces, while the people also struggle with unemployment, inactive lifestyle, and living in small apartments without adequate green spaces allocated per capita. Although, some patchworks try to preserve and protect the fructiferous of the public site as a picture of past landscape, they have not yet provided public parks and old gardens for social and fruitful activities.

Conservative approaches through the rules and regulations which aim to defining and protecting the urban historical gardens as the permanent and long-term land uses, do not guarantee farming activity. Even though land preservation in master plans and another planning tool is necessary, it will not guarantee agricultural activity over time. While garden's landscape is regarded as the scenery for human leisure and garden's nature preserved as existing only as the resources for outdoor recreational services, a strong tendency is the diversification of production and services. The geometric parceling of uniformed plots, as well as the variety of local fruit, vegetables, and ornamental plants provide a high scenic quality, but the society requires to plan and program theses gardens based on more than recreational resources.

Thanks to the structure and spatial designing of the Persian gardens, as mentioned previously, there are distinctive principles of integration for the productive and ornamental open spaces, which involvement the inhabitants will not disturb the current recreational and official uses. But even

more, providing the possibilities for public engagement will guarantee the conservation of the other current utilizations, due to moving the garden from the marginal spaces in the heart of citizens living, working, education, training, and feeding environment.

On the other hand, the principles and criteria of agriculture's productive landscape design have not yet been gone on green infrastructure to shape the integral agriculture and productive landscape. From the perspective of place-making strategies, Persian gardens will be supposed to act as the base layer for redesigning urban parks. In this way redesigning and creating urban parks will include agriculture based on the principles of the Persian gardens spatial organization (transforming the spaces).

The last finding of this study is that the Persian garden can find a new role in Iranian cities beyond being a cultural landscape and tourist attractive site, and that is its significant role in envisioning the urban agriculture in particular Iranian context through providing the traditional distinctive productive landscape features, presenting the local version of principles of designing the integrative landscape, and its potentiality (place, space, structure, elements, and heritage) for getting involved the urban residents into agricultural activities.



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