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The productive landscape in Persian Gardens; Foundations and features

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Abstract

The purpose of this study is to explore the dimensions and attributes of productive and agricultural landscape in the Persian gardens. The methodology of conducting this study 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). The results, which show the need to provide recreational services for owners, guests and in some cases people, has led to the significant presence of fruitful greenery, even in the governmental gardens. There are various fruit trees in the gardens of Shahzadeh, Amirabad and Pahlavanpur which demonstrate the importance of targeted food products for human consumption as well as animals in the system of designing the traditional green spaces. Promotion the quality of the beauty of inner green scenery of the gardens is other characteristics of agricultural landscape, specifically in Birjand's gardens which the visual landscape system has been created by composition of fruitful and ornamental species. Additionally, attitudes into increasing the efficiency, profitability and self-sufficiency of landscape have been ordered the planting of multipurpose plant species in the Iranian garden design. There are varieties of vegetables and herbs in the garden of Shahzadeh, and fragrant flowers, saffron, plum, pomegranate and fig trees representing in Birjand's garden proving the medicinal properties of productive scenery in addition to their appropriateness to the climate and scarce resources. Throughout history the structural importance of the edible landscape in Persian garden is due to the knowledgeable use of green spaces and landscaping. The combination of ornamental horticulture and fruit farming results in a multi-functional garden. Therefore, the agricultural landscape can be introduced as an indicator to assess the quality of garden management, an efficient tool for assessing the status of agricultural knowledge, gardens health assessment, as well as evaluating the lifestyle and the natural- cultural continuity of a garden to its context which should be considered more by the researchers.

Key words

Productive landscape, Pleasure gardening, Agricultural landscape, Culture of agriculture, Persian garden.

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Introduction

Nowadays, the socio-economic benefits of edible landscaping motivates the landscape architects to integrate the urban agricultural phenomena into the development of landscape and open spaces, considering the productive dimensions of 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 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 productive scenery. In parallel the recognition of contexts, the causes of the formation and the impact of these factors on the specific characteristics of agricultural landscape is another objective of this research.

Material and methods

The methodology of this study 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 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 terraced

gardening in a slope 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 (Fig. 1).

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 agricultural 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 knowledges 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

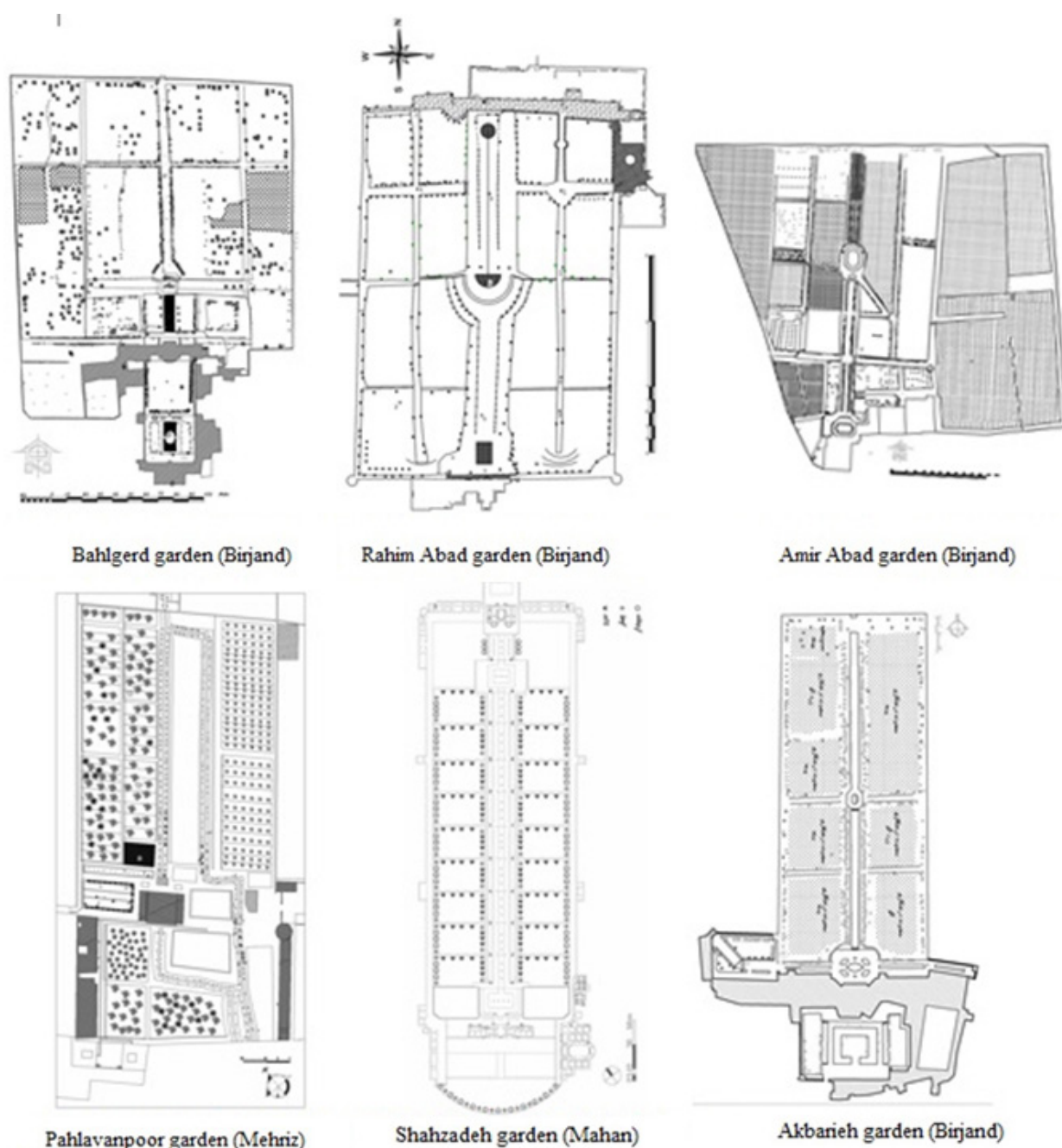


Fig. 1. Plans of the case studies. Source: authors.

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 make a special 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 ceremonial 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.

The foundations of productive landscape in Persian gardens

Cultural-religious context

In the ethical books and treatises as advices 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) clearly praised a non-nomadic life of farmers and confirmed restoration of moorland. Similarly, the Islamic philosophers considered the agriculture as the fundamental activity for establishment the order and the job for survival the humankind. Concerning agriculture 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 was sacred, and planting the wheat, fodder and fruit trees has 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 important charters of the Tabas (a desert city in east of Iran, in South Khorasan Province) religious dedicated letters is insisting the benefactors on priority of preserving and developing the farms, gardens and trees over other things. Therefore, the productive landscape reflects the influence of Islamic-Iranian context in Persian gardens by considering agriculture, horticulture and land reclamation.

Geographic- environmental context

Persian gardens were generally formed in areas with the specific characteristics of the geographic bed which helps boost the agriculture and horticulture. Shahzadeh 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 cool 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 (Bahlgard and Amir Abad gardens) and connected to the rural structure (Akbariyeh and Rahim Abad gardens); (Fig. 2). In fact, a series of natural factors prepare the land fertility and enable garden productivity in presence of water (Jeyhani & Omrani, 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 basic reasons of developing the gardens was the economic policies and the use of the products (Heidarnattaj & Mansouri, 2009), the gardens were be looked as a resources of building the self-sufficient society (Naghizadeh, 2013).

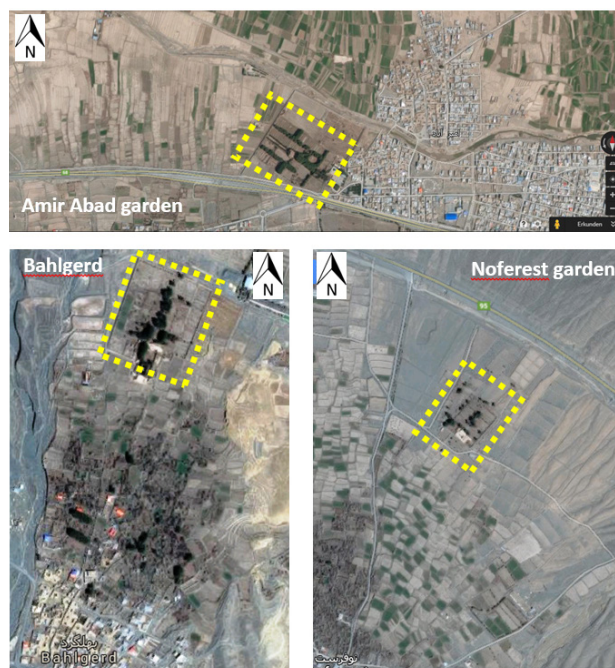


Fig. 2. Ecological and structural relationship of the historical gardens with the agricultural and rural context in Southern Khorasan Province in Iran. Source: www.Google Earth.com

Accordingly, the concept of economic usefulness makes the fruits very important (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 to the landscape is planting the saffron in Birjand's garden. Despite the low 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 economic utilization of water, land and labor, have provided the socio-economic context of planning and designing the fruitful greenery in historical gardens.

Characteristics and features 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 uses (Shahcheraghi, 2013) leading people to visit and use of 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 has also fruit trees in addition to its private outdoor recreational services. Another example are 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 17th 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). Thus, one of the functions of those ceremonial and formal gardens was provision 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 main garden space (Pourmand & Keshtkar Ghalati, 2011; Jeyhani & Omrani, 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 above mentioned plant system, can be categorized into four spatial status 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 (Fig. 3).

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 products, 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 (Fig. 4). In this regard, Iranian gardens can be called healing gardens or health landscape, because plants with edible fruits or herbs is one of the design principles of healing gardens (Nikbakht, 2004). This attribute was not applied only in productive gardens, even the royal gardens in Tehran during the Qajar period had fruit trees and vegetables (Soltani, 2007).

| | | | |
|---|---|--|-----------------|
|  |  |  | Vegetal Point |
| Pistachio in Amir Abad garden | Fig tree in Rahim Abad garden | Quince tree in Shahzadeh garden | |
|  |  |  | |
| Pomegranate tree line in Amir Abad garden | Pistachio tree line in Bahlgerd garden | Pomegranate tree line in Rahim Abad garden | |
|  |  |  | Vegetal Surface |
| Surface edible plants in Amir Abad garden | Herbs surface in Akbariyeh garden | Surface edible plants in Rahim Abad garden | |
|  |  |  | Vegetal Volume |
| Volume of apricot in Akbariyeh garden | Volume of pistachio in Akbariyeh garden | Volume of Pomegranate in Pahlavanpur garden | |

Fig. 3. 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. Source: authors.

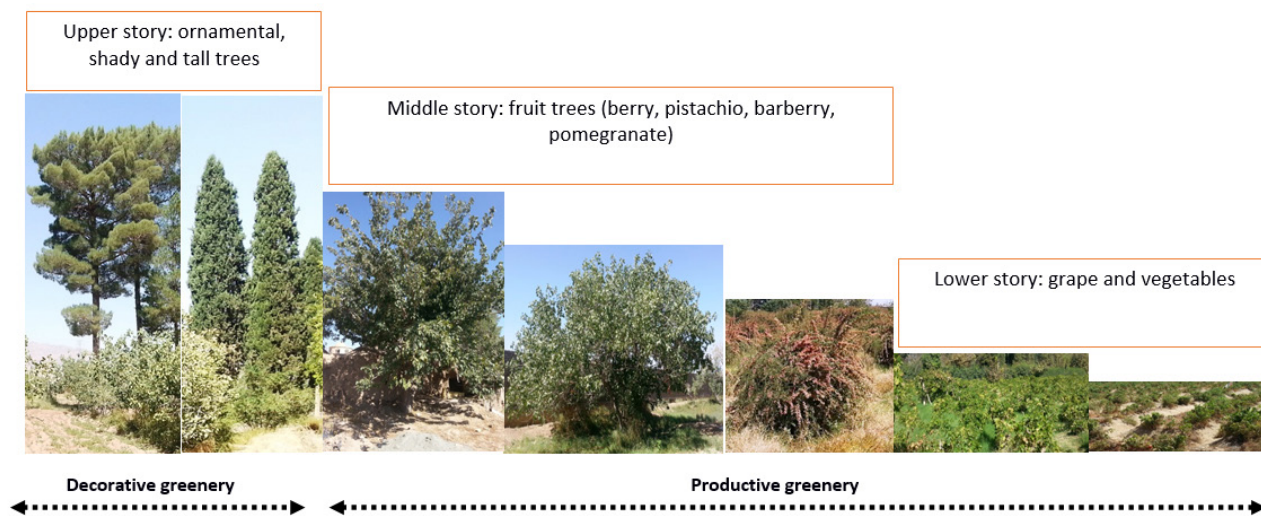


Fig. 4. Elevation structure of utilitarian and pleasure greenery in Amir Abad garden (Birjand). Source: authors.

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 1 shows the authors 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). Table 2 mentions the animal species that lives in the Shahzadeh Garden.

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 main axis and reveals the importance of edible species in the painting of the beautiful gardens.

As figures 5 and 6 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 is provided by making the ornamental plants such as pine and cypress as a darker and green vertical background. This really 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 to the main axis, the spectator looks the united landscape which consists of productive species in the foreground and ornamental species in the background.

Multi-functional plant species

The core of “multi-purpose plantation” are the multi-purpose 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 main function (Fruit, wood or shadow) have

Table 1. Comparison the diversity of productive and ornamental plant species in the case garden studies. Source: authors.

| Garden name | Fruitful plants | Ornamental plants |
|---|--|---|
| Akbariyeh (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 |
| Amir Abad (Ceremonial-residential-agricultural) | pistachio, apricot, pomegranate, grape, jujube, berry, walnut, almond, fig, barberry, wheat, barley, vegetables | Pine, cypress, Plane tree, ornamental flowers |
| Bahlgerd (Ceremonial-residential-agricultural) | Pistachio, apple, pomegranate, barberry, wheat, barley, potatoes, onions, eggplants, pears, apricots, plums, rose | Pine, cypress, Plane tree, elm, Iranian grass |
| Pahlavanpur (Residential-agricultural) | Pomegranate, berry, fig, grape, apple, plum, peach, almond, apricot, persimmon, pear, quince, red plum, walnut, hawthorn | Plane tree, boxwood, roseslh |
| Rahim Abad (Governmental-ceremonial) | Rose, jujube, berry, fig, pomegranate, apricot, almond, walnut, plum, black pepper, grape | Cypress, pine, tulips, geranium, Junipers, ivy, shallots |
| Shahzadeh (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 |



Fig. 5. 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. Source: authors.



Fig. 6. The frame and decorative background for demonstrating the productive shapes in the Rahim Abad garden (Birjand). Source: authors.

Table 2. Wildlife species of Shahzadeh garden. Source: authors based on Bildar Mahani, 2014.

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

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 plants (alfalfa) which is 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, the acquisition of a range of ecosystem services (fruits, leaves, bark, wood, roots, feed, pharmaceuticals, and scenery) has 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 to fill the space between the rows of apricot, by peach, plum and red roses (Ruggles, 2008). The local xeriscaping principles tells that the garden space must be zoned to several areas considering the scarcity and water. One area is around the palace which requires irrigation to

grow vegetables and seasonal flowers in order to enhance the visual effects of decorative plants. But the adjacent to the main 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 of 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 medicinal plants (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 in 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, Baguien & 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 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 certain kind of plant system that complies the environmental 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 3). 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 fruitful gardens, explains dedicating the large 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 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,

Table 3. Productive landscape features in the gardens of this study. Source: authors.

| Characteristics | Definition | Examples in garden studies |
|---|---|--|
| Landscape of outdoor recreation | Supplying multiple consumable and non-consumable services to owners, guests, and people | Agricultural sceneries in governmental gardens of Birjand and Shahzadeh garden |
| Flexibility in composition | 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 |
| Edible and nutrition aspects | Food production for human consumption and other animals | Various fruit trees in Amir Abad, Shahzadeh and Pahlavanpur gardens |
| Ecological Landscape | Providing safe habitat for humans and animals | Shahzadeh garden as a haven for birds, insects and small animals |
| Aesthetic function | Promotion the quality of beauty of green visual landscape | Creation of visual composition of productive and ornamental species in the gardens of Birjand |
| Multi-functional plant species | 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 |
| Climate oriented and optimum landscape | xeriscaping, zoning the space of the garden, selection the species in adaption to the climate in order 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 |
| Healing landscape | considering to the human five senses, organic products, aromatherapy and herbal therapy | Various varieties of fruits, medicinal and fragrant flowers |

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 to traditional knowledge and science and focus on new approaches to environmental restoration of the historical 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 operations of planting and harvesting fruit species requires 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 agriculture, horticulture and production among owners and managers, and organizations in charge of the garden.

Index of garden health

According to the properties of agricultural landscape mentioned in this paper, 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 in 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, multi layered, and diverse identity can be an index to measure the health and vitality of the garden.

Index of life style

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 life style 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.

Index 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 agriculture and horticulture can be done through the study of existing historical gardens. The attitude and behavior as the cultural context changes the utilitarian agriculture. On the other side, the real economic output of the agricultural landscape has also been important. 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 historical gardens. Therefore, the stability, efficiency, and vitality of agricultural greenery depend on its relationship with its multiple contexts. In fact, parallel to the disruption of the gardens and its context, the agricultural features will be suffer of a declining trend until taking integration and continuity of its context and thus can measure the continuity of the garden and its bed.

Conclusion

The results show that the issue of 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 historical 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 is applicable in 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.

Endnote

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