Ancient Urban Gardens of Persia: Concept, History, and Influence on Other World Gardens

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Summary. The history of Persian gardens goes back to a few millennia before the emergence of Islam in Iran (Persia). Designs of Persian gardens have influenced and are used extensively in the gardens of Al-Andalus in Spain, Humayun's Tomb and the Taj Mahal in India, and many gardens in the United States and other countries around the globe. *Bagh* in the Persian language (Farsi) means garden and the word Baghdad (the capital city of Iraq) is rooted from the words *bagh* and *daad* (meaning "the garden of justice"). Pasargadae, the ancient Persian capital city, is the earliest example of Persian garden design known in human civilization as *chahar bagh* or 4-fold garden design. Bagh-e-Eram, or Garden of Eden or Eram Garden, is one the most attractive Persian gardens and is located in Shiraz, Iran. There are numerous other urban ancient gardens in Iran, including Bagh-e-Shahzadeh (Shazdeh), meaning "The Prince's Garden" in Mahan, Golestan National Park near the Caspian Sea; Bagh-e-Fin in Kashan; Bagh-e-El-Goli in Tabriz; and Bagh-e-Golshan in Tabas. The design of each Persian garden is influenced by climate, art, beliefs, poetry, literature, and romance of the country and the region where the garden is located. In addition, each garden may have a gene bank of fruits, flowers, herbs, and vegetables. Although countless gardens were destroyed in the hands of invaders throughout the centuries, Persians have attempted either to rebuild or build new gardens generation after generation, each of which has become a favorite destination to tourists from around the world.

Introduction, history, and concept of Persian gardens

Gardens and green spaces have always played a significant role in Iranian history and culture, as evidenced by the gardens of the ancient city of Pasargadae from ≈3000 years ago and the garden of Cyrus the Great, the outline of which remains visible today (Mahmoudi Farahani et al., 2016). In the Persian language, these gardens were called *pardis*, from which the English word paradise—in the sense of heaven—derives (Fallahi, 2017a). From the era of the Achaemenian and Sasanian dynasties, Iran itself was conceptualized by its rulers and citizens as a huge garden with surrounding walls that encompassed different tribes and beliefs, with every reward promised to be in heaven. This vision was evident from a speech about Iran and its walls by Persian King Anushirvan of the Sasanian dynasty. However, the fantasized walls came down and Arabs, Turks, Mongols, and others went into Iran. Still, the concept of the Persian garden remained in Iran, and all these conquerors continued to build gardens (Daryaee, 2014).

Another word used to describe pleasant spaces planted with trees and shrubs is *bagh*. For example, the word Baghdad (the capital city of Iraq) is rooted from the words *bagh* and *daad* (meaning "the garden of justice"), as the ancient Persian city of Ctesiphon and Supreme Court of Ivan-e Madayen during the Sasanian dynasty of Persia were located near Baghdad. In the past, Persian elite ensconced themselves in these lavish private gardens, nine of which have been named collectively as the Persian gardens and count among Iran's United Nations Educational, Scientific and Cultural Organization World Heritage Sites. They include the Ancient Garden of Pasargadae near the tomb place of Cyrus the Great, Eram Garden, Chehel Sotun Garden, Fin Garden, Abbas Abad Garden, Shahzadeh Garden, Dowlat Abad Garden, Pahlavanpour Garden, and Akbariyeh Garden. In addition to their aesthetic beauty, it is arguably the ability of these gardens to adapt to and flourish in extreme climates that render them remarkable. The Iranian plateau is not a conducive environment for gardens to thrive. Little rainfall, extreme hot and dry temperatures in the summer, and cold temperatures in the winter, as well as gusty winds provide less than opportune conditions (Fallahi, 2017b; Tajaddini, 2011). These human-made havens therefore relied on proper use of space and a subterranean irrigation system (SIS).

Throughout time, these gardens have shifted in terms of layout, aesthetics, and use. During the Sasanian Empire, between the third and seventh century, a time in which the Zoroastrian religion was dominant, flowing water and fruit trees played a vital role, as illustrated in the garden designs replete with fountains and ponds (Fallahi et al., 2018). After the Arab conquest, the ancient Persian concept of *chahar bagh* (four gardens) was used in Persian landscaping, placing a greater emphasis on aesthetics, mirroring the Garden of

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Units

To convert U.S. to SI, multiply by	U.S. unit	SI unit	To convert SI to U.S., multiply by
0.4047	acre(s)	ha	2.4711
0.3048	ft	m	3.2808
0.0929	ft^2	m^2	10.7639
1.6093	mile(s)	km	0.6214

Eden described in verses of the Koran as a place where two rivers intersect, thereby dividing the garden into four quadrants. The Mongolian invasion during the 13th century brought with it ornamental and decorative floral species. Finally, during the 17th and 18th centuries (the Safavid dynasty), a palace became an extension of the garden. In other words, residential quarters or a pavilion were constructed on the garden grounds and became an integral element of the Persian garden.

Influence of Persian gardens on gardens in other countries

Over millennia, the Persian garden had a major influence on and served as inspiration for other gardens around the world—from the Alhambra in Spain to the Taj Mahal and Mongolian Garden in India to the paved and tiled Andalusian courtyards with arcades, pools, and fountains testifying to their Persian roots (Ghavidel, 2008). When Alexander the Great conquered parts of the Persian Empire in 334 BCE, he brought back with him new varieties of fruit and other plants, and these materials were later grown in Gardens of Lucullus (Horti Lucullani) on the Pincian Hill at the edge of Rome (Bowe, 2004). The concept of the Persian garden prompted an interest in horticulture that was renewed in Europe around 60 BCE (Bowe, 2004). Fallahi et al. (2002), when describing the history of apple (*Malus domestica*) rootstocks, reported that the use of dwarf horses (*Equus ferus caballus*) and dwarf trees was popular in Persia, as illustrated in the hieroglyphic of Persepolis, the palace of Achaemenian, and other documents and monuments of the Sassanian and Parthian dynasties. By the mid 15th century, the use of dwarf apple rootstocks for training trees in different shapes and forms in gardens became more common, and paradise (derived from the Persian word *pardis*) apples became an important component of todays' dwarf rootstocks, which facilitate establishment of modern, high-density apple orchards.

It was around the Safavid and Qajar dynasties that western gardens also began to influence the gardens of ancient Persia, most notably in the types of flowers, shrubs, and plants (Ghavidel, 2008; United Nations Educational, Scientific and Cultural Organization, 2018).

In past decades, the influence of the Persian garden can be seen in numerous parks and landscaping landmarks around the world. Longwood Gardens (Kennett Square, PA) is one of the world's great horticultural displays, encompassing more than 450 ha of dazzling gardens and woodlands. In our opinion, several aspects of Persian gardens, such as the concept of *chahar bagh* or *charbagh* and waterways, are merged with other garden designs at Longwood Gardens. The Walled Gardens in Untermyer Park, also known as Untermyer Garden, in Yonkers, NY, is an excellent example of a garden mimicking the design of ancient Persian gardens of antiquity in the modern western world. This garden was developed by Samuel Untermyer during the early 20th century and is considered "America's greatest forgotten garden today" (Gannon, 2017; Untermyer Gardens Conservancy, 2019).

In modern days, attention has been given to the influence and integration of Persian garden concepts with park designs of the new world where Iranian immigrants reside (Ghavidel, 2008; Yazdani, 2018; Yazdani and Lozanovska, 2016, 2017). Yazdani (2018) revealed that historical icons and cultural landscapes play prominent roles in inspiring Iran's park environments, whereas sociocultural activities, restoration, and bonding with the past have great importance for Iranian immigrants in Australia.

Elements of the Persian garden

The naturally unsuitable environmental conditions throughout much of Iran called for creative artificial engineering in Persian gardens including four major elements: land, water, plants, and space (United Nations Educational, Scientific and Cultural Organization, 2018). These elements serve a practical purpose, such as water for irrigation, and an aesthetic one in the form of waterways, fountains, and ponds. Bright colors and the use of tiles at the bottom of the pools enhanced the aesthetics.

Constructing these gardens on various levels not only allows for irrigation, but also the opportunity to create waterfalls, which are another attractive feature. Without water, the Persian garden cannot exist; therefore, flowing water is central to the concept because its presence is conceptual, functional, and aesthetic. Because these gardens are in regions where water sources are scarce, irrigating the land is a major concern. Water from underground SISs, springs, or rivers functions to irrigate the land by waterways (Mahdi Nejad et al., 2017).

Vegetation is a vital part of the Persian garden and includes diverse trees, shrubs, and flowers. The types of plants in these gardens vary according to location, but serve different functions, including providing shade and ornamentation. Evergreens, such as iranian cedar (*Cupressus sempervirens*) and turkish pine (*Pinus brutia*), and deciduous trees, such as ornamental plane tree (*Platanus orientalis*), are the main types of trees used in Persian gardens. Fruit-bearing and shade-providing trees are also featured prominently in Persian gardens. Pasargadae Garden is believed to have been used as both a hunting ground and a garden of fruit trees for consumption (Ghavidel, 2008).

The last element of the Persian garden is the architectural space. Persian gardens are enclosed by surrounding adobe walls, offering seclusion and solitude. These walls are borders of the gardens themselves and serve as a boundary between the arid, uncultivated land outside and the protected, so-called paradise inside (Massoudi, 2009). Within the borders of the wall, water flows throughout the garden to create one space despite the geometric patterns created by the waterways. The *chahar bagh* feature reflects the earth, sky, water, and God, thereby providing an almost ethereal quality (United Nations Educational, Scientific and Cultural Organization, 2018). Unlike European gardens, the geometric and symmetrical features of Persian gardens are visible to the observer on the ground.

In the following sections, we look at some examples of Persian gardens around Iran and describe some of their defining qualities, features, and styles.

Bagh-e-Fin, Kashan

The city of Kashan, located in Esfahan Province, has two main parts:

mountain and desert. The eastern part of the city faces the central desert of Iran, where one can find the Maranjab Desert, which is known for its shifting sands, and Salt Lake.

Bagh-e-Fin, or Fin Garden, therefore, is a welcome retreat from Kashan's otherwise desertlike dryness (Fig. 1). Fin Garden is the oldest surviving garden in Iran, which exemplifies the *chahar bagh* element. This garden was completed in 1590 under the Safavid dynasty; however, what remains of it is from the Qajar rule between 1799 and 1834. Bagh-e-Fin was given life from the nearby Soleymanieh Spring (Mahmoudi Farahani et al., 2016). This spring is in the proximity of the ancient Tepe Sialk, a *ziggurat* (an ancient temple tower with the form of a terraced pyramid of successively receding stories), the oldest settlement of which dates back to 6000 and 5500 BCE. The existence of this nearby spring is also the reason this location has been favored by various kings and governments throughout history. Fin Garden was developed over time, and this is reflected in the exquisite architecture of the main pavilion, which contains features from the Safavid, Zandiyeh, and Qajar eras and is replete with fresco paintings, plasterwork, woodwork, and stained-glass windows (United Nations Educational, Scientific and Cultural Organization, 2018). The bathhouse, located on the left side of the garden, is the site where Amir Kabir, a chancellor during the Qajar era, was murdered by an assassin.

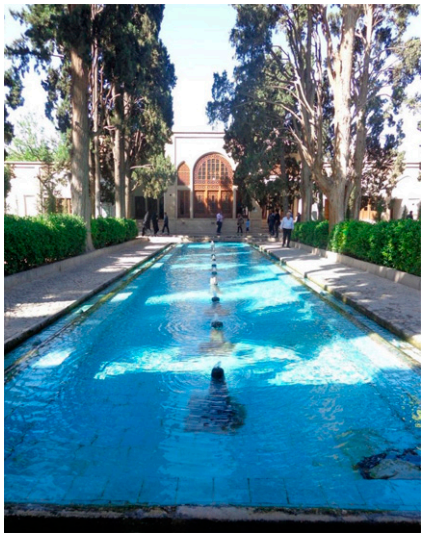

Fig. 1. Bagh-e-Fin (Fin Garden) is located near Kashan, Iran, and uses many water features and rows of trees.

A major characteristic of Fin Garden is water. The pools and fountains of this garden, which function entirely without the use of mechanical pumps, are sourced by an SIS from the surrounding hillside. These pools are lined with blue tiles and now contain goldfish (*Carassius auratus*) that, along with the bubbling fountains, create a pleasant atmosphere.

Sarv-e-kashan or iranian cedar trees line the walking paths and provide shade for this 2.3-ha garden. Other vegetation includes ornamental plane trees, white poplars (*Populus alba*), long-leaved violet willows (*Salix acutifolia*), weeping willows (*Salix babylonica*), and forest boxwood (*Buxus hyrcana*). Fruit trees such as fig (*Ficus carica*), mulberry (*Morus alba*), apricot (*Prunus armeniaca*), green gauge plum (*Prunus domestica*), pear (*Pyrus communis*), pomegranate (*Punica granatum*), and quince (*Cydonia oblonga*), as well as various decorative flowers are also plentiful (United Nations Educational, Scientific and Cultural Organization, 2018).

Bagh-e-Eram, Shiraz

Located in Shiraz, the capital of Fars Province in southern Iran, along the northern shore of the Khoshk River, Bagh-e-Eram, or Eram (Persian for paradise or heaven) is a 110,380-m^2 rectangular garden with a west-to-east slope. The main pavilion is located on the western end, and there is a central pool. Although the layout of the garden is said to have begun during the 11th century by the Seljuk dynasty, it is suggested it was actually built in the 13th century during the Ilkhanate dynasty (Wilber, 1979). Water streaming down the blue-tiled fountains and ornamental pools leads to a three-story pavilion flanked with vibrant mosaics and inscribed with the poems of Persian lyric poet Hafez. Like many other sites in Shiraz, the structure underwent renovation by the subsequent Zand and Qajar dynasties.

Today, the garden and building are part of Shiraz's Botanical Garden. There is an abundance of fruit- and nonfruit-bearing trees as well as various medicinal plants and countless decorative flowers. Fruit trees include pomegranate, medlar (*Mespilus germanica*), sour orange (*Citrus aurantium*), persimmon (*Diospyros kaki*), apple, pear, quince, apricot, almond (*Prunus amygdalus*), and persian walnut (*Juglans regia*). Among the nonfruit trees are turkish pine, iranian cedar, persian maple (*Acer velutinum*), weeping willow (*Salix babylonica*), mountain ash (*Eucalyptus regnans*), pussy willow (*Salix cinerea*), silver dollar tree (*Eucalyptus cinerea*), and white poplar. The sarv-e naz shirazi or shiraz cypress (*C. sempervirens* var. *cereiformis*) is a towering tree plentiful in this garden (personal observation) and is one of the oldest—said to date back 5000 years. Bagh-e-Eram mainly sources its water from a spring that runs out in a stream to join several SISs to form a river that divides into many brooks to irrigate not only nearby gardens, but also the city of Shiraz (United Nations Educational, Scientific and Cultural Organization, 2018).

Bagh-e-Golshan, Tabas

Lying in the remote eastern town of Tabas, Bagh-e-Golshan is one of the most breathtaking gardens in Iran. Dating back to the Zand and Qajar dynasties, this garden was constructed under the order of Mir Hossein Khan, a governor of the city of Tabas appointed by Nader Shah during the Afshariyeh dynasty during the 18th century.

Given its isolated location between two salt deserts, the Lut and the Kavir-e-Markazi, the abundance of water to this 3.25-ha plot of land seems inconceivable, but it is, like other gardens, sourced from an ancient subterranean SIS system. This garden is also designed with the *chahar bagh* feature, with two streams intersecting.

Fruit trees such date palm (*Phoenix dactylifera*), sour orange, and pomegranate grow abundantly here, as do other trees such as cypresses (*Cupressus* sp.) and cycads (Cycadophyta), and decorative flowers such as wild rose (*Rosa persica*) and hollyhock (*Alcea rosea*). This vertical garden leads to a centrally located pool where pelicans (*Pelecanus occidentalis*) have taken residence (E. Fallahi, personal observation).

Bagh-e-Shahzadeh, Mahan, Kerman

Located about 35 km southeast of Kerman in Mahan, Bagh-e-Shahzadeh or Shazdeh (The Prince's Garden) is a Qajar-era, walled Eden of towering trees and cascading water (Figs. 2 and 3). This garden is 5.5 ha and sits on a 6.4% slope that contains a 20-m height difference from top to bottom (Abbasalizadeh Rezakolahi et al., 2015). As a result of this difference in height, the water flowing from the upper end to the lower end creates a symphony that is pleasant to the ear, and the fountains shooting water upward are delightful to the eye (Bachari, 2012). The water, which is supplied by the Tigran underground SIS from the nearby town of Joupar, is carried longitudinally (Abbasalizadeh Rezakolahi et al., 2015). It is thanks in part to this SIS as well as the plentiful sunshine, fertile soil, and mild winds that this garden has been able to flourish in an otherwise arid, unforgiving environment.

Fig. 2. Bagh-e-Shazdeh (The Prince's Garden) in Mahan, Iran, has the most fascinating water features among all ancient Persian gardens.

Fig. 3. The pavilion in Bagh-e Shazdeh (The Prince's Garden) in Mahan, Iran, has a two-floor residential structure at the upper end, facing water fountains, and rows of ornamental and edible fruit trees.

The exquisite two-story *sardar khaneh*, or entrance, is equipped with paired columns, colorful tiles, stucco, plaster moldings, and gazebolike structures that jut toward the inside of the garden. The building on the garden's upper side was dedicated as the living quarters of the prince. Among the trees in this garden are evergreens, such as turkish pine and iranian cedar, and shade-providing trees such as common ash (*Fraxinus excelsior*), ornamental plane tree, white poplar, and field elm (*Ulmus minor*). Grape vines (*Vitis vinefera*) and several fruit-bearing trees such as apple, pomegranate, quince, pear, apricot, peach (*Prunus persica*), and black plum (*P. domestica*) grow alongside flowerbeds with various decorative flowers (Bachari, 2012).

Bagh-e-Dowlat Abad, Yazd

Dowlat Abad Garden in Yazd is said to have the most complex layout of Persian gardens (Fig. 4). With an area of about 40,000 m^2, it was constructed in 1740 by Mohammad Taghi Khan, a governor of Yazd, during the Zand rule. A 208-m-long pool, the longest in Iran, with 47 fountains runs down the center of the garden between the octagonal summer and winter quarters (United Nations Educational, Scientific and Cultural Organization, 2018).

The winter pavilion faces the south, thereby absorbing more natural sunlight. On the opposite side, the summer pavilion is arguably best known for its windcatcher, which towers 33 m into the Yazd city skyline and is said to be the tallest of its kind in the world (Akhgar et al., 2013). This ancient, natural ventilation system, which was an essential architectural element in residential buildings and structures located in the desert, kept the water at near-freezing temperatures. Garofalo (2016) analyzed the *karbandi* of the Hashti pavilion at Bagh-e-Dolat Abad. *Karbandi* is a spatial system obtained through the projection of a star-shaped drawing onto a curved surface. He reported that the *karbandi* of the octagonal vestibule of the Hashti pavilion consists of a complex roof system that completes the octagonal volume of the room below; its intrados presents a pattern of interlocking ribbed arches. Garofalo (2016) also studied the drawings, module, and proportions of the Hashti pavilion with the exclusive purpose of providing a key to reading geometries that, although complex in appearance can, in reality, be traced using a simple ruler and compass.

Other features of this building include stained-glass doors and windows. This colorful glass serves many purposes, some of which include blocking the view from the outside. They block direct sunlight to protect rugs and other decor, and their reflections are said to keep mosquitos away. Some local people claim this type of glass has health benefits, including the prevention of Alzheimer's disease and depression (Fallahi and Fallahi, interview with local people).

This garden sources its water from five small SISs that originate in the nearby town of Mehriz. These historical SISs date back two centuries. Trees in this complex include turkish pine and iranian cedar. Fruit trees and vines include pomegranate, mulberry (one tree of which is said to be the complex's oldest), and, to a lesser extent, fig, olive (*Olea europaea*), and grape (E. Fallahi, personal observation).

Bagh-e-Pahlavanpour, Mehriz

Located about 35 km from Yazd in the town of Mehriz is Bagh-e-Pahlavanpour, which has been nicknamed "the garden town of Yazd." Although this 25,000-m^2 garden was largely constructed during the Qajar dynasty, many of its architectural highlights belong to the Zandieh era. The property was first established by Hassan Mullah Reza, who then

Fig. 4. Bagh-e-Dowlat Abad in Yazd, Iran, has a main pavilion with a large water pool and rows of trees on both sides of the pool.

passed it on to his son-in-law, Ali Pahlevan. The summer and winter residences were once occupied by the town's noblemen (United Nations Educational, Scientific and Cultural Organization, 2018).

The water in this garden is sourced from an SIS that enters through the southwest and goes through the Anjirak watermill, filling the basin and gutters, before entering the Mirza Nasrollah watermill on the eastern end, after which it proceeds to irrigate the garden (United Nations Educational, Scientific and Cultural Organization, 2018).

Pahlavanpour Garden consists mostly of turkish pine and iranian cedar trees, with fruit-bearing trees such as fig and pomegranate. The brooks that run through the garden to irrigate the land are flanked by ornamental plane trees (Aladin Travel, 2019).

Bagh-e-Chehel Sotun, Esfahan

Located in Esfahan, Bagh-e-Chehel Sotun is a 16th-century Safavid-era garden measuring 6.75 ha (Mahmoudi Farahani et al., 2016). The courtyard in the pavilion contains 20 slender columns made from the trunks of ornamental plane trees. These columns, combined with their reflection in the large pool in front, give the garden its name, which means "40 columns" in Persian, and count among the garden's most notable features.

Plants and trees in Chehel Sotun Garden are mainly comprised of turkish pine, persian elm (*Ulmus boissieri*), black maple (*Acer nigrum*), ornamental plane tree, cade juniper (*Juniperus oxycedrus*), iranian cedar, forest boxwood, norway maple (*Acer platanoides*), white poplar, egyptian acacia (*Acacia nilotica*), bay laurel (*Laurus nobilis*), and common ash, among others. Water is supplied by a stream that continues to the Naqsh-e-Jahan Square after irrigating the garden. Ornamental stone fountain jets carved as lions and people have been placed around the pool.

Inside the pavilion in the Royal Hall, the walls and ceilings are graced by exquisite frescos and gilt. Frescos depict epic battle scenes as well as the king's reception of guests for banquets and ceremonies. These frescos continue on the outer facades of the palace. The south facade even includes paintings of Europeans, which were painted by two Dutch artists who were frequent visitors (E. Fallahi, personal observation).

Bagh-e-Akbariyeh

Bagh-e-Akbariyeh is located just 5 km outside Birjand in the South Khorasan Province, a city known for its plentiful sunshine. There are few clouds in this area, so the shortage of rain and rapid evaporation of water creates some challenges for a garden. The water, however, is supplied by the eponymous SIS, which runs to a *miansara* basin, where it branches out and runs underneath the main building and into the garden.

Akbariyeh Garden has a variety of plant species, including many indigenous plants. Trees include turkish pine, iranian cedar, common ash, and juniper (*Juniperus* sp.). Fruit-bearing trees and shrubs include pistachio (*Pistacia vera*) and plum. Various other shrubs and seasonal flowers also grow here (P. Fallahi, personal observation).

Bagh-e-Joogh, Mako

This garden is in a village called Baghcheh Joogh, which is 5 km from the city of Mako. Bagh-e-Joogh was built by Governor Eqbal-o-Saltaneh at the end of the Qajar dynasty and it has been used as museum complex since 1988 (P. Fallahi, personal information).

Bagh-e-Cheshmeh Belghies

This beautiful garden was built toward the end of Qajar dynasty in a town called Ghaleh Kareh, located in the state of Boyer Ahmad. In 1951, this garden was expanded by its new owner, Eskandar Khan Charmin (P. Fallahi, personal information).

Bagh-e-Kalat-e-Naderi

Kalat-e-Naderi is essentially a fortress that was built during or before the Achaemenian Empire of Persia (550–330 BCE). This fortress is surrounded on three sides by high cliff walls that range from 500 m on the south side to 650 m on the west side, with lower eastern walls and a gently sloping plain leading up to the heights from the north. This is the only fortress that withstood the siege of Tamerlane from 1336 to 1405 (Dalrymple, 2018).

The garden complex of Kalat-e-Naderi was rebuilt by Nader Shah Afshar (King Nader) in the city of Kalat, located northeast of the city of Mashhad. By the decree of King Nader, a building called Emarat-e-Khorshid (House of the Sun), with magnificent architecture and Persian artwork, carvings and paintings, was built in this garden complex for the tomb of King Nader, who died in 1747 (Dalrymple, 2018).

Bagh-e-Saad Abad, Tehran

The Garden of Saad Abad is located in the southern foothills of Alborz Mountain in the north of Tehran. Initially, an 8000-m^2 garden used to lodge Qajarid authorities before 1920. Then, Reza Shah the Great, founder of Pahlavi dynasty, expanded and added the Green Palace Kakh-e-Shahvand to the initial 8000-m^2 complex in 1923 (Jalali, 2017). This garden has two features that are different from older Persian gardens. First, many plants (shrubs, trees, and flowers) are imported from Europe and other regions of the world. Second, Saad Abad garden plants are grown alongside local species, along streams, and throughout the garden according to their height and the land's topography. Today, this garden is used as an important museum and is visited by tourists from around the world every year.

Other Persian gardens

Numerous other ancient botanical gardens still exist in Iran, including Ghadamgah Neishapour, Garden of Shookat Abad Birjand, Garden of Delgosha in Shiraz, Garden of Hasht Behesht in Esfahan, Garden of Divan Khaneh (Chehel Sotun) in Mazandaran, Garden of Abbas Abad in Behshar, and Garden of El Goli in Tabriz. It is important to remember that countless other magnificent gardens existed throughout Persia's long and rich history, but were destroyed by invading Arabs, Mongolians, and Tamerlanes for various cultural and religious reasons.

Outlook and conclusionary remarks on Persian gardens

The Persian garden as a concept has a long history. Persian gardens are secluded and peaceful environments that survive under environmentally

harsh conditions. The concept of *chahar bagh* is among the most prominent features of the Persian garden that dates back millennia. In Persian gardens, pavilions and luxury buildings for Persian aristocrats are often built. Designs and artifacts of each of these lavish buildings and gardens were influenced by the geopolitical situations of the time, beliefs, and the personal taste of its resident. Nevertheless, most of these gardens are surrounded by walls and all have waterways, rows of shade and fruit trees, and flowers in common. Unfortunately, a large number of these gardens were completely destroyed so that nothing remains, as a result of repeated attacks by invaders over centuries. Luckily, there are efforts by most Iranians, residing either inside or outside of Iran, to pay special attention to the value of these ancient gardens and the importance of preserving them (Rahnama and Pouremad, 2013). These efforts, meshed with the ease of global travel, advancement of technology, ease of communication, and urgent need for water conservation, as well as greater awareness and a sense of responsibility for protecting the environment provide hopeful signs for the rejuvenation and maintenance of the ancient gardens of Persia.

Some features of ancient Persian gardens are being used ingeniously in modern horticulture in Iran and many countries with a similar climate, including India, Australia, and the United States. Despite current political issues and the worldwide shortage of water, brilliant Iranian scientists and farmers have meshed rich Persian architectural and garden designs with advances in various fields of horticultural science (floriculture, vegetable and fruit), and have devised amazing orchards and gardens in Iran. A typical example of this ingenuity can be seen at Fadak Farm near Qum, Iran. In this 100-ha olive orchard, a uniquely structured chimney, similar to the one in Dowlat Abad Garden, is built to convert the hot wind of the desert to a cooling system by going through a water misting spray for storing olives, without any electricity or other sources of power (Fallahi et al., 2005). In this farm as well as many other orchards, the magnificent architecture at the entrance to the orchard highlights the combination of the passion of Iranian growers for Persian garden design and the science of horticulture. Efficient use of water by drip irrigation and rainwater storage in reservoirs and SISs in Arzhang Kooh Agricultural Center near the Fashandak region in Taleghan, Iran, and several other locations are example of ideas taken from the water-saving features of Persian gardens applied to practical agriculture (Fallahi et al., 2005).

We hope peace and calm prevail in the Persian Plateau and other regions of the world. Only under a peaceful environment will scientists and farmers be able to combine the ingenuity and experiences of the old world, such as the principals of the Persian garden and the exchange of resistant plant materials, with new technologies and discoveries to combat or alleviate diseases, pests, and water shortages worldwide.

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