



Study on the Design of Agricultural Landscape at Jingshan Entrance of Hangzhou-Changxing Expressway

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Abstract: As a window for displaying the city's image, the landscape of the highway entrance has become the focus of urban construction. However, as urban construction is bound to occupy more cultivated land, the contradiction between urban construction and cultivated land protection has become increasingly prominent. Therefore, applying agricultural landscape at the highway entrance for creating a beautiful space with historical characteristics and rich farming culture is an effective way to solve this contradiction. Here, to explain the design concepts, ideas and principles of the application of agricultural landscape, Jingshan entrance of Hangzhou-Changxing Expressway was studied. The results showed that the tea hills at Jingshan Entrance created a rich rural cultural landscape of Zen-Tea culture, thus the city's entrance became the most distinctive first scenic line without changing the use of agricultural land, and the people who enter the toll station gradually immersed themselves in farming landscape and the mood of Zen-Tea culture. Considering that, the agricultural landscape is featured with production value, leisure value and aesthetic value. It can not only alleviate the contradiction between city construction and cultivated land, but also has a unique and profound aesthetic effect on the city entrance, and reconnects urbanites with rural. In this case, attention should be paid to agricultural landscape in the process of transportation planning and urban planning, and urban agriculture is worthy of further practice and research in urban construction, agriculture heritage protection, ecology, production, education, entertainment, community participation, agricultural tourism, industrial integration, health preservation and other aspects.

Keywords: Highway Entrance, Agricultural Landscape, Urban Agriculture, Jingshan Entrance

1. Introduction

In 2021, *Central Document No. 1* once again focuses on issues relating to agriculture, rural areas, and rural people, highlights the significance of retaining “one billion and eight hundred million acres of arable land red line”, and makes the strategic plan of “overall layout of ecological, agricultural, urban and other functional spaces”. Against this backdrop, how to achieve the organic combination of agricultural land and urban construction and to implement the overall planning of land spatial functions has become a major subject at present and in the future. To this end, integrating agricultural landscape into urban construction, namely extending arable land to cities, can not only expand and enrich conventional urban landscapes, but also promote

the sustainable development of productive urban agricultural landscape [1], which might alleviate the contradiction between urban construction and agricultural cultivated land to a great extent. Finding more sustainable modes of agriculture that allow to produce more and lowering pressure on biodiversity, is becoming an urgent research issue [2]. Besides, the highway entrance, as the junction of urban and rural areas, is a focal point where material, energy and information exchanges between urban and rural areas take place. Therefore, the construction of agricultural landscape at the highway entrance is of great realistic significance.

2. The Concept, Function and Significance of Agricultural Landscape

Agricultural landscape refers to the landscape functional space mainly created by agriculture crops. It is a kind of low-maintenance sustainable landscape with leisure value, cultural value, ecological value, aesthetic value and productive value regarding providing a variety of experiential activities including recreation, participation, education, entertainment, fitness and others for urban residents or visitors [3]. Notably, its merits are threefold. First and foremost, it can effectively increase the urban and rural landscapes and contribute to biodiversity, which extends the ecological service function of the urban green space system, and enriches agricultural output. In the second place, it can lower the maintenance cost of urban green space [4]. Last but not the least, in the meantime of serving as both the supply urban dwellers with fresh agricultural and sideline products, agriculture landscape generates employment, creates greenbelts for leisure, gardening and health rehabilitation, and stimulates local economic development [5], it can respond to urban residents' appeal for returning to farming life and the nature. So, urban agriculture (UA) and peri-urban agriculture (UPA), which is the application of agricultural landscape in cities or suburbs, is regarded as an emerging tool and strategy for sustainable urban development as it addresses a wide array of environmental, economic and social objectives [6].

Agricultural landscape has existed since ancient times. In 1902, Howard, a British scholar and social activist came up with the concept of "Garden City" [7], brought agricultural landscape into urban construction and thus created the theory of agricultural landscape. Later on, theoretical research on agricultural landscape and its application to urban construction made tremendous progress. In China, with the introduction of the overall layout concerning ecological civilization construction, the practice of new rural construction and the implementation of rural revitalization strategy since the 18th National Congress of the Communist Party of China, agricultural landscape has been put into more wide-scale use, and plays a unique role in harmonizing the relationship between man and nature [8] and promoting the coordinated development of cities and nature. Nonetheless, at present, no report on the design and application of agricultural landscape at the junction of urban and rural areas, namely the highway entrance can be retrieved.

3. The Significance of Constructing Agricultural Landscape at the Highway Entrance

With the continuous urban expansion, development and opening-up, the highway entrance to the city is not positioned as a "boundary" or a "node". Instead, it functions as a transitional regional access from rural areas to cities. With its urban and rural settings, it is not only endowed with the implication of the "gateway", but also works for providing

regional service. Specifically, it is a window that exhibits the unique features, social, economic, ecological and cultural landscapes and the image of urban and rural areas, and is the most active regional space for urban and rural construction around the city. Therefore, the highway entrance has excellent demonstration effect and regional advantages, and the distinct practical significance of applying and promoting agricultural landscape at the highway entrance is as follows:

- (1) In the light of resource integration, the highway entrance can integrate the human, land, financial, technological and market resources of urban and rural areas together to the hilt, which lays a solid foundation for the development and promotion of urban agriculture.
- (2) When it comes to urban and rural planning, the agricultural spaces at the highway entrance are inserted into the city in a radiating wedge shape along the road leading to the city. Thus, a petal-shaped villatic green corridor is formed, and the city is closely linked and integrated with rural areas, which brings radical changes to urban planning, urban spatial frameworks and urban ecological landscape construction.
- (3) On account of industrial and economic development, agricultural landscape at the highway entrance could take the advantage of talent, technology and market in the city to develop modern high-tech agriculture, community-supported agriculture, intelligent agriculture, circular agriculture, innovative agriculture, shared agriculture, leisure agriculture and agricultural science popularization on the premise of avoid damaging arable land. Moreover, the food supply system can be established in the neighborhood for the purpose of addressing issues pertaining to grain supply and non-grain food supply for people. In short, the highway entrance is the optimal land for the application and promotion of agricultural landscape, which can narrow the gap between urban and rural areas, preserve ecological environment, and enhance people's perception of environment and agriculture with alarming effect. According to statistics, 800 million people worldwide (FAO2016) and 266 million people in developing countries local were involved in urban agriculture [9].

4. A Case Study of Constructing Agricultural Landscape at Jingshan Entrance

4.1. A Brief Introduction to Jingshan Entrance of Hangzhou-Changxing Expressway

Jingshan Entrance is located at Jingshan Interchange of Hangzhou-Changxing Expressway in Jingshan Town, Yuhang District, northwest of Hangzhou City (See Figure 1). It is a vital node that facilitates Hangzhou to implement its integrated strategy of extending its tourism, culture, industry,

transportation and urban and rural areas to the west. As for Jingshan Town, it is famous for its unique Buddhist culture, tea culture and bamboo tea industries, and possesses Wanshou Temple that tops the list of “five mountains and ten temples in the south of the Yangtze River” and the historic site of *The Classic of Tea* written by the world-famous Lu Yu who is reckoned as “the saint of tea”. Furthermore, Jingshan Town is listed in the experimental zone and demonstration area where the strategy of establishing “the most beautiful villages in China” is tried out. Generally speaking, this town is positioned as the Zen Lifestyle Town that shows the Zen Tea artistic conception of “the world’s Jingshan Mountain and the first town of Zen Tea” and as the town with the most salient artistic

conception of Zen Tea.

The design scope of Jingshan Entrance consists of three parts, namely Hangzhou-Changxing Expressway Interchange, 15 provincial expressway interchanges and expressway toll stations. There are two on-ramps and two off-ramps at Hangzhou-Changxing Expressway Interchange in the north-south direction, while the 15 provincial expressway interchanges are equipped with two off-ramps and one on-ramp in total. Therefore, the entrance is featured with clear and convenient traffic organization, and has continuous hilly tea gardens whose overall scenery is fresh, refined and elegant, thus being celebrated for its sightseeing tourism (See Figure 1 and Figure 2).

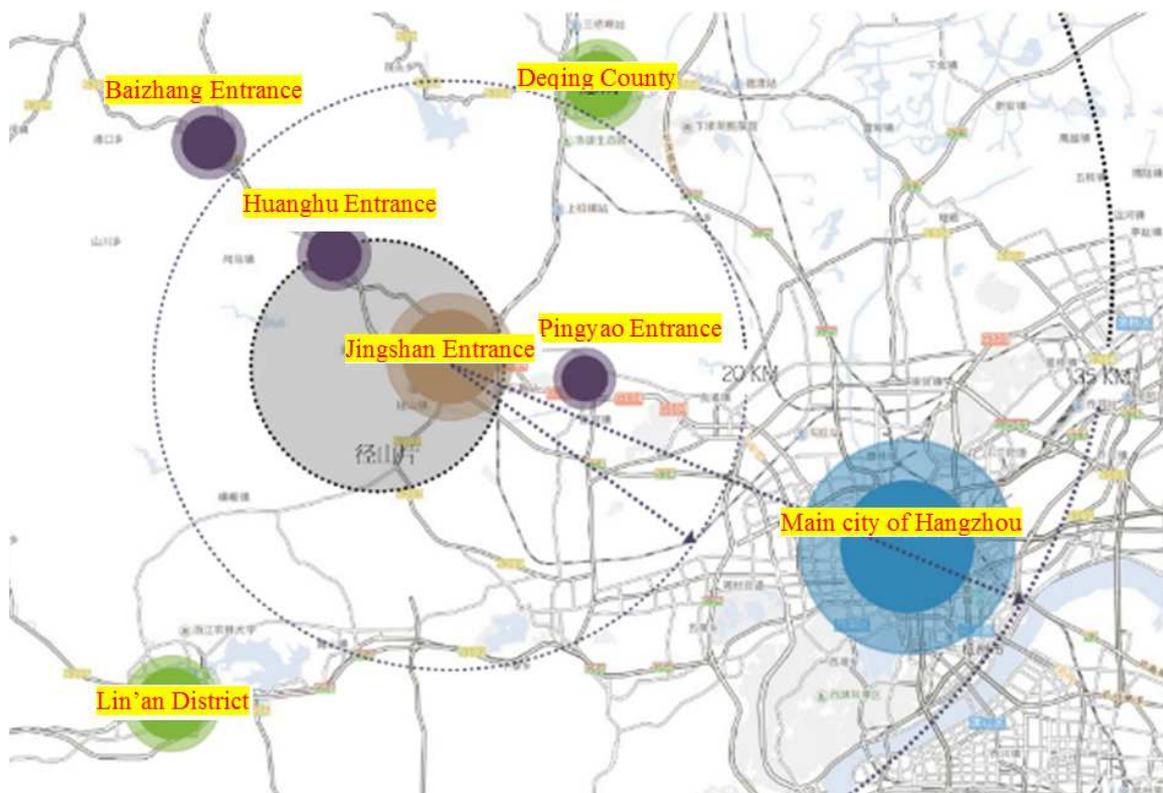


Figure 1. District Programming (downloaded from the Internet).



Figure 2. Jingshan Entrance of Hangzhou-Changxing Expressway (The picture is taken onsite.).

4.2. Design Objective and Philosophy of Agricultural Landscape at Jingshan Entrance

Design objective: It is aimed at building a distinctive and beautiful highway entrance with agricultural landscape and tea culture.

Design philosophy: It adheres to the design philosophy of “feeling the pulse of villages, enjoying the pleasure of visiting rural areas, and appreciating the mood of Zen Tea”. Under the context of constructing national country parks to realize “holistic and grand tourism”, the landscape of Jingshan Entrance is planned and designed following the “holistic rural scenic spot” concept. In this case, the site’s originality and local conditions and customs should be reserved and shown respect for. On this premise, the landscape design should revolve around such agricultural elements as “Zen Tea, mountains and waters, bamboo and tea

gardens” so as to shed light on Jingshan Mountain and its regional rural culture. Meanwhile, under the guidance of “resource integration, regional integration, and imitation of the nature” and in virtue of the scenery and terrain or in other words, the beautiful agricultural landscape, a state-level rural

tourism network characterized with “experiencing Zen Tea and its culture” will be established. By doing so, the artistic conception of Zen Tea, namely “the world’s Jingshan Mountain and the first town of Zen Tea” is created (See Figure 3 and Figure 4).



Figure 3. Design Scope Chart of Jingshan Entrance (self-painted).



Figure 4. Landscape of Jingshan Entrance (self-painted and taken on site).



Figure 5. Real Shot from Aerial View.



Figure 6. Real Shot of the Greenbelt at the Roadside.

4.3. Design Principles

(1) The principle of integrity in agricultural landscape

The commonly accepted and used road greening method is abandoned. Instead, agricultural and humanistic resources that can embody the features of Jingshan Mountain are jointed with the highway entrance so as to form a whole and expand the space. In addition, the pastoral tea hills are set as the background of the highway entrance in order to act up to the principle of establishing the “holistic scenic spot”, hence demonstrating the distinctive agricultural landscape, or to be specific, the large tracts of “low-rise mountains, and gentle slopes and valley terraced with tea trees”, and at the mean time, to meet the needs in the aspects of ecology, economy, society and tourism [10].

(2) The principle of garden aesthetics in agricultural landscape

Within the framework of the terraced tea hills, the principles and techniques of landscape design and means of artistic expression such as proportion and scale, rhythm and rhyme, as well as primary and secondary points under the influence of speed are skillfully put to use. In the end, a spatial form which exhibits virtual-real comparison and is freely retractable and rich in layers comes into being.

(3) The principle of ecology in agricultural landscape

Ecological integrity within the range of the highway entrance and tea gardens should be maintained. By arranging various species of plants and pondering over the seasonal changes and landscape layers of plants, habitat fragmentation and isolation can be avoided, without using chemical fertilizers, pesticides and herbicides, which is conducive to the sustainable development of the ecology. Studies had showed that food grown on small-scale areas in and near cities is likely to be relatively favourable for some ecosystem services, such as supporting healthy soils [11].

(4) The principle of uniformity and diversity in agricultural landscape

The tea gardens originally located at the highway entrance will be retained so as to achieve the uniformity of landscape. However, agricultural landscapes are complex systems affected by a diversity of biotic and abiotic processes at multiple scales [12], so it should be noted that in the meantime of sticking to uniformity, changes and diversity cannot be ignored. For this purpose, it is suggested to assimilate epoch characteristics and modern design methods into traditional tea gardens, forming seasonal changes and bringing variation to spacial layers. At the same time, semi-natural habitats and the interplanting model in tea gardens should be established for the sake of safeguarding biodiversity of tea gardens (See Figure 5).

4.4. Design Ideas

The terraced tea hills on both sides of the highway entrance will be preserved as the foundation for subsequent agricultural landscape design, while the space is opened in a moderate degree based on the spacial and visual streamline. Against the

backdrop of tea hills, in the mid-term view, large rural trees such as *Sapium sebiferum* and tufted *Celtis sinensis* are planted in isolation, with tall trees being retained, and medium-sized colored arbors, green open space as well as ornamental trees being added. In the foreground, white sand and landscape walls are increased, and besides, the perennial flower belt or flower border that is rich in its underlying organizations is utilized to create a welcoming atmosphere. Meanwhile, the landscape boundary should be blurred so as to better integrate the agricultural landscapes into local life, construct a landscape without a boundary, and form diversified spatial relationships and multi-directional visual effects.

4.5. Greening Design (See Figure 6)

In terms of greening design, the following design ideas are proposed and followed. Firstly, changes should be taken into account when seeking uniformity. Under the background of agricultural landscape that is composed of tea gardens and bamboo forest, each section and functional space shall be designed with a specific theme, and configured with plants in accordance with their respective theme. For instance, if there is little variation in background trees, a concise, bright and comfortable space appears, which grants drivers a sense of linearity. Furthermore, the collocation and combination in each section are supposed to comply with its theme so as to create a landscape with a unified tone and seasonal variations. Secondly, colors of plants should be contemplated according to the season. A multitude of colored trees, seasonal flowering trees and perennial flowers are arranged elaborately for the purpose of expounding the contrast and echoing of different color blocks. For example, *Pinus thunbergii*, *Pinus parviflora* and white sand are taken in the foreground, while the original large *Ginkgo biloba* is relocated to the rear. Besides, large colored trees, including *Celtis sinensis*, *Sapium sebiferum*, *Koelreuteria paniculata* and *Zelkova serrata* are planted at the back of tea hills. Thirdly, ecological laws should be obeyed strictly. It is expected to build a landscape that adapts to the natural ecological community. The layers of arbors, medium-sized arbors, shrubs, ground covers and other plant levels should be taken heed of and arranged reasonably for maximizing the green looking ratio and green quantity, and giving full play to the anti-pollution and noise-isolation effectiveness of trees. Beyond that, Leguminous ground cover plants are employed to cover the tea gardens and bamboo forest. It is advised to choose local plants with strong adaptability, easy maintenance and good viewing effect. Moreover, the original plants that grow well in the tea hills, such as *Cinnamomum camphora* with elegant shapes should be reserved. Last but not least, safety should be guaranteed. Apart from widening the field of vision in tea hills, an adequate distance of lawn and ground covers at both the beginning and end of the isolation belt existing in the center of the road should be spared so as to expand drivers' vision and ensure their safety in the course of driving.

Arrangement of plants: In accordance with above greening design ideas, the following plants are arranged. Trees at the

upper stratum included *Ginkgo biloba*, *Celtis sinensis*, *Sapium sebiferum*, *Koelreuteria paniculata*, *Zelkova serrata*, and *Sapindus mukorossi*. The middle stratum were flowering *dungarunga*, consisted of *Prunus yedoensis*, *Amygdalus persica 'Duplex'*, *Malus spectabilis*, *Prunus mume*, *Acer palmatum 'Atropurpureum'*, *Acer palmatum cv Dissectum*, etc. The lower stratum was flowering shrubs, composed of *Rhododendron simsii*, *Loropetalum chinense var. rubrum*, *Camellia sp. Sabina procumbens*. And lowermost stratum included perennial flowers suitable for local conditions. As for trimmed and shaped trees, *Pinus thunbergii*, *Pinus parviflora* and *Pinus taiwanensis* were selected.

4.6. Design of the Toll Station

The design of the toll station is inspired by Jingshan Temple so as to integrate the building into the agricultural landscape. To be specific, the toll station shows the Song Dynasty architecture style, with semicircle-shaped tiles and white walls, which comes down in one continuous line with the style of Jingshan Temple. Besides, the facade is three-stage, which is high in the middle and low on both sides, and responds to the three-stage building volume of Jingshan Temple. Furthermore, structure and building materials have been innovated. The main body of the building is composed of steel structure, while the semicircle-shaped tiles that comprise the roof are made of copper, and the bucket arch is replaced by a simplified steel-structure bucket arch, making the overall effect of the building simple but solemn.

4.7. Design of the Water System

The original agricultural irrigation systems with ponds, ditches and others included will be preserved to the maximum. Then, low-impact design and construction of the irrigation water system will be carried out to turn it to a landscape water system. Apart from that, the pond sideline will be adjusted, and the block stone revetment and aquatic plants will be added. In addition, it is intended to enrich the green areas beside the waters and the variety of modeling trees, in an attempt to open up the space appropriately and make the water surface and ornamental plants available to people's vision.

4.8. Public Art Design

In general, the principle of simplifying it by cutting out the superfluous is born in mind. To this end, only a fake hill stone that is engraved with the words "Tian Xia Jing Shan" meaning the world's Jingshan Mountain will be placed at the exit of the highway entrance, which expresses the theme of "Jingshan Mountain" and "the Buddhist mood", and is concise, enjoyable, elegant and wonderful.

5. Discussion

5.1. The Application of Agricultural Landscape Can Create the Most Distinctive City Entrance

The agricultural landscape at Jingshan Entrance becomes a

window for demonstrating the Zen tea culture at Jingshan Mountain. As the original terrain of tea hills, bamboo forest, the water system and indigenous plants are arranged in a reasonable way, the features of Jingshan Mountain's Zen Tea are open-and-shut. The scenery is forged by the nature, and the world is as how people feel it. Urban agriculture is a unique form of agriculture that may enhance biodiversity in urban areas [13]. So, apart from tea gardens, paddy and wheat fields, rape field, lotus pond, orchards and the like all contribute to beautiful agricultural landscapes, and they can not only be used for agricultural production, but also awake people's recognition of local culture, thus further creating the most unique landscape at the highway entrance.

5.2. The Application of Agricultural Landscape Can Achieve Integrity and Ecology Easily

The green space at the highway entrance belongs to the category of linear space which is fragmented into green landscapes of different sizes due to the intricate road system. Therefore, it is of importance to keep the ecological integrity and simplicity within the scope of the highway entrance. In this context, the application of agricultural landscape is an optimal option that could alleviate the effect of habitat fragmentation and isolation. And the agriculture/biodiversity trade-offs can be mitigated through landscape composition and configuration [14], so ecological agricultural landscape requires approaches for managing landscapes holistically by incorporating anthropogenic habitats [15].

5.3. The Application of Agricultural Landscape Is an Effective Way to Carry Out Intensive Greening at the Highway Entrance

With the help of agricultural landscape, the greening construction at the highway entrance can obtain the best results at the lowest cost, by creating intensive greening at the highway entrance. To be specific, agricultural landscape that accords with the design method of "reallocating resources, implementing overall planning and conforming to the nature" could lower down maintenance cost of the green space at the highway entrance, minimize resource consumption, enhance utilization rate and ecological benefits, facilitate the harmony between people and nature, and maximize its economic benefits.

5.4. The Application of Agricultural Landscape Provides a Multi-functional Space for Experiencing Farming Life

Constructing landscape functional space at the highway entrance in virtue of agricultural landscape is advantageous, valuable and feasible, which responds to people's desire for rural farming life, while people's participation and visits in return add spice to the landscape.

5.5. The Application of Agricultural Landscape Will Play a Stimulative Role in Developing Urban Agriculture

Owing to its special location, the agricultural landscape at the highway entrance has guiding significance and

demonstration effect. The agricultural landscape design at Jingshan Entrance involves multiple disciplines and cutting-edge technology, such as Sponge City technique based on rainwater collection and recycling, and reasonable disease monitoring and control techniques. Now more and more attention are given to automation and other innovations, such as vertical farming, related technologies, digital platforms, real-time surveillance, and artificial intelligence [16].

However, smallholder agriculture and land is abandoned due to the low income of farmers and lack of interest in agricultural activities among young generations [17]. So, promoting industrial integration development is necessary [18], just as Columbia's Agriculture Park with demonstration gardens, playgrounds, picnic areas, a nature classroom education center and urban farm plots [19], etc.

6. Summary

The agricultural image composed of the continuous tea hills at Jingshan Entrance creates a new cultural landmark, which enables people to immerse themselves in their memory of farming life and the artistic conception of Zen Tea, and becomes one of the highlights in the application of agricultural landscape. On this account, the agricultural landscape featuring production value, ecological value, social value, leisure value as well as aesthetic value can not only alleviate the contradiction between urban development and construction and the shortage of arable land, but possesses distinct and profound aesthetic meanings and the function of fusing multiple industries. To sum up, the application of agricultural landscape to the highway entrance sets a good example for other cities that plan to follow the suit, and is thus worthy of attention during transportation planning and urban planning.

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