

Planning and Design of Urban Eco-agriculture Landscape with Health Care Benefits: A Case Study on Future Homeland Project

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Abstract. In modern urban life, people pay more and more attention to health. Eco-agriculture landscape with health care benefits has got academic attention. On the basis of experiences of developed countries, combining with regional characteristics & policy support of Wuhan, this paper summed up the main elements and planning methods of the urban eco-agriculture landscape, and it also draws up the comprehensive experience mode of the eco-agriculture landscape with health care benefits in view of the case study on future homeland project. These creative ideas for the planning and design could guide the practice and development of agricultural landscape in the future.

1. Agricultural landscape with ecological functions and its development opportunity

Ecological environment nowadays is increasingly being disrupted. People generally live in a complex, changing, disorder, high-pressure urban environment, leading to the impetuous tendency in society and multiplied sub-health population while the national economic growth gradually slowed down. Eco-agriculture landscape planning with health care benefits cannot only be a slogan and new landscape planning and design cannot focus only on the aesthetic research of visual appearance. Mood regulation and emotional release in high efficiency and scientific methods are the urgent tasks that landscape planning and design face in modern time[1].

Urban agricultural landscape with health and well-being benefits involves the agriculture of metropolitan area and its surrounding areas. It is a kind of regional economy, which is located around the urbanized area and the clearance between the area. It mainly relies on and serves the urban and rural people in the surrounding areas. Its main mission is to provide high quality agricultural and sideline products as well as healthy and beautiful ecological environment, which is mainly based on Non-staple food production project, environmental-ecological engineering, bioengineering and information engineering. On behalf of the extent of market economy development and the level of technological content, it is characterized by multi-level, multi-functional, and multi-directional opening, which is a sustainable development of the modern regional agricultural landscape[2]. Since the 1960s, the population has gradually increased, and the process of urbanization has been accelerated. Pollution-free, unexplored arable land is scarce while traditional agriculture is under great pressure. The world has focused on the research of new kind of agriculture[3]. The boundary between cities and countryside is gradually blurred. Urban ecological agriculture with health benefits in the modern city is the inevitable result of cultural, economic, social and technological development. This new



agricultural system model takes the initiative to adapt to urban development, which is the link between urban and rural areas, and broaden the development of urban and rural space. It is a new agricultural landscape with marketization, intensification, industrialization. It has the functions of ensuring the basic living standards, developing the economy, balancing ecology, artistic appreciation, tourism & leisure, exporting, education demonstration and increasing farmers' income[4].

"To speed up the reform of ecological civilization system and build a beautiful China, promote green development, focus on solving environmental problems, intensify the protection of ecosystems, and reform the ecological environment supervision system," was stressed at the 19th National Congress of the Communist Party of China[5]. Construction of ecological civilization is the Millennium Development Plan for the sustainable development of the Chinese nation, including that increasing the pilot units of ecological agriculture, improving the ecological civilization system with information technology integrated with the market, promoting green production and consumption and establishing a socialist ecological civilization. Pains for the moment, gains for the millennia[6]. Comprehensive three-dimensional analysis of the elements of agricultural landscape with health care benefits and its positive impact on human health demand immediate attention.

This paper analyses the basic characteristics of future homeland project, the features and needs of its clients, and lays the theoretical foundation for the later construction of agriculture landscape with health care benefits.

2. Eco-agriculture landscape technology and concept of health care benefits

The ecological technology adopted in the eco-agriculture landscape focuses on systematic research to reflect the main elements of health and art perception, such as ecology, function, volume, natural characteristic & diversity, pollution rate, cleanliness and other factors. The merits of planning are mainly related to geographical, terrain and human factor[7]. There are many kinds of applications of eco-agriculture landscape technology, but the most effective and convenient applications are mainly reflected in water resources, planting, materials, construction, processing and demonstration.

2.1. Ecological technology of landscape water resources

Water purification and water saving technology. Constructed wetlands and biological floating island are commonly utilized to purify the water. The constructed wetland mainly contains vertical flow constructed a wetland, subsurface flow constructed wetland and surface flow constructed a wetland, which is mainly used for sewage treatment[8]. Biological floating islands absorb and degrade the nitrogen, phosphorus and other elements in water through the growth process of plants, thereby effectively improving water quality. In the meantime, plant photosynthesis and transpiration regulate micro-climate of the water surface[9]. The method of water-saving mainly includes transdermal enhancement technique, aerial drainage technique, reclaimed water technique and drip irrigation technique, which are mainly implemented with raw materials of the garden and the planning and design of terrain slope and grassed swales.

2.2. Ecological technology of landscape planting

Crop rotation, intercropping and three-dimensional planting could balance the land nutrients, improve the ability of resistance to pests and diseases with the use of plant growth characteristics and their differences, resulting in a colorful and characteristic landscape. The widespread use of ecological pesticides and artificial release of natural enemies are beneficial to killing pests, balancing farmland ecological environment.

2.3. Ecological technology of landscape materials

Ceramic tiles are laid with non-slip landscape materials that are made from a reasonable ratio mix of industrial waste materials and other materials with adding adhesive, resulting in high porosity, good permeability materials after high-temperature firing. The permeable concrete is mostly composed of aggregate, cement, water, redispersible polymer powder and latex. It has the advantages of permeable,

breathable, light-weight, antifreeze, high bearing capacity, beautiful and low maintenance cost. Plastic-wood composite material is a kind of new material extracted from waste sawdust and plastic with the features of corrosion-resistant, flexible and simple[10]. Solar photovoltaic glass involved in the photovoltaic process through the light, condenser, scattering, conductive and other properties, demonstrating high-strength, corrosion resistance, anti-aging advantages[11].

2.4. Ecological technology of landscape architecture

The roof garden is a garden on the roof of a building with the decorative benefit, which saves the building's energy consumption and adjusts the building's micro-climate[12]. Vertical green wall place plants on the indoor and outdoor surface of the building. It is fixed by the high-intensity grid, and actively adjusts the micro-climate for the indoor and outdoor environment[13]. The vertical farm makes reasonable and efficient, flexible use of indoor three-dimensional planting space and renewable energy & greenhouse technology, to simulate growth environment of crops, achieving efficient agricultural production and effectively reducing the cost of pesticide use and logistics[14].

2.5. Ecological technology of landscape processing

Agricultural internet of things is an information exchange system offering agricultural landscape product traceability service. It involves the cultivation, production, logistics, warehousing, wholesale, design, manufacture, purification, retail, sale, experience, feedback and other links and coordination of the entire information flow is a requirement of realizing the traceability service of the agricultural landscape. Timely optimization of agricultural landscape quality could increase agricultural income[15].

2.6. Ecological technology of landscape demonstration

IFLD system, a full-body motion sensor based Immersive Forest Landscape Display, integrates multiple Kinect somatosensory controllers and multi-channel seamless fusion projection systems and is applied to the agricultural landscape demonstration. It provides an agricultural landscape environment that visitors completely immersed in, and enable free dialogue between participants and the environment with LED discoloration lights and music, creating a new landscape interactive experience for visitors[16].

The future homeland project is located at Tianpu village and Penghua village, Jiangxia District of Wuhan city in Hubei province with Ezhou city in the east, Liangzi Lake in the west. It sites closer to the central districts of Wuhan, covering and attracting various industry. The number of university teachers and students around is stable with new students registering every year, thus the demand for the popular science of ecological agriculture is obvious, and the scholarly groups are generally easy to accept the lifestyle of landscape with health benefits. Eco-agriculture landscape technology is centrally used in future homeland project, including ecological technology of landscape water resources, such as artificial wetlands and floating islands, automatic irrigation system, which is efficient and beautiful; the whole set of ecological technology of landscape planting, such as the landscape art formed by crop intercropping while using a variety of ecological materials to save energy and regulate microclimate; the whole set of ecological technology of landscape architecture, such as agricultural networking system, biological purification, waste regeneration. The ecological technology displayed in the landscape can bring and improve fun and interactive experience for the visitors.

Rational use of ecological technology enhances the comprehensive appearance of the landscape. In the macro aspect, it creates forward-looking health care concepts and in the meso aspect, it put forward a comprehensive evaluation system and its application model while in the micro aspect, it promotes health concepts and improves the health and happiness index of the affected population[17](Figure 1-2).



Figure 1. The architecture and landscape, Aerial View



Figure 2. The future home landscape, Square perspective

3. The pattern and design of the eco-agriculture landscape.

On planning and construction of industrial parks of urban eco-agriculture landscape, in addition to emphasizing landscape art and agricultural products which represents geographical characteristics, it still need to analyse the successful experiences of ecological agriculture in western developed countries, including the aspects of ecological services, landscape values, nature conservation and cultural heritage and other multi-functional cross-integration. The agricultural system created in this way can greatly improve the quality of the agricultural landscape[18].

3.1. Pattern analysis of urban eco-agriculture landscape in western countries

France is the first European agricultural country emphasizing ecological agriculture planning in the first place. The concept of ecology and environmental protection is widely accepted among France. With stabilized eco-agricultural products market, it developed and implemented the Eco-agriculture development plan. Its main measures include the establishment of reasonable, flexible and detailed agricultural laws and regulations; to guide and strengthen consumption concept of eco-agricultural products. Germany is a big country of industrial production. In order to clear the pollution caused by industrial manufacturing, the mode of planting industrial crops is developed, and ecological agriculture is expanded vigorously too. Bioenergy crops are used to produce mineral energy and chemical raw material alternatives. A biological raw materials and bio-energy research center was established, which deeply studies the cultivation and new technologies of industrial crops and coordinates its promotion, thus providing sufficient new raw materials for the chemical and paper industry. On the basis of organic agriculture, the United States emphasized the new farming system of sustainable agriculture and put forward the model of sustainable eco-agriculture development. It was a kind of ecological recycling agriculture offering a comprehensive benefits package. Most of the agricultural systems emphasized the combination of agriculture and animal husbandry. It balanced the relationship between the aquaculture and planting industry in the feed, fertilizer and other aspects, and made them make use of each other[19]. Sweden attached importance to the research and development of high-quality food and its derivatives production; the Netherlands placed more emphasis on the eco-agriculture model of transformation of nature due to its natural conditions[20].

3.2. Comprehensive experience mode of urban eco-agriculture landscape

Modularized landscape infrastructure is highlighted in the pastoral farming system which utilizes the high-quality ecological technology to make the agricultural production become industrialized and stabilized with high-yield, and not is affected by the climate and the season. It innovates the design of agricultural and horticultural tourism and improves land use efficiency. Comprehensive experience pattern is mainly achieved by carrying out sightseeing tourism, science exhibition, shopping and other projects with the design of nursery stock garden, flower garden, Chinese herbal medicine garden, vegetable garden, fruits garden and so on. In the same time, it should make full use of universities and research institutions, cooperate with high-tech development zone and agricultural research units, and introduce and develop new technologies and varieties to provide technical support for modern agriculture or provide supporting facilities for the study of high technology. Community farms and public farms are constructed while professional tourism agriculture and experience marketing agriculture are developed as well. With the increase of sites for studying agronomy knowledge, eco-

agriculture landscape with interactive experience is fully developed. To build a comprehensive agricultural landscape museum, the materials of the distinctive agricultural production, life, allusions, ancient villages and other materials with regional characteristics should be collected and displayed for visitors to facilitate their study and research[21].

3.3. Future development ideas of urban eco-agriculture landscape

The classic cultural characteristics in the planned landscape are deeply studied and classified. Taking ecological civilization construction on low-carbon as the main tone and emphasizing the artistic creative thinking, the urban eco-agriculture landscape is constructed with interdisciplinary theories to create several types of charms and positive & far-reaching significance[22]. Combining with modern new technologies, new ideas, new species, new materials, the new trend, it brings new ideas and fantastic imagination with a strong sense of the future to the ecological landscape by introducing the space theme, cartoon theme, science fiction theme, popular star theme, art theme, etc or the introduction of famous paintings and contemporary famous artists, and creates new ideas through the use of multi-styles. This model mainly highlights the artistic impression, and effectively enhances the region's fashion sense and advertising effect, resulting in good economic benefits and the development of new areas[23].

3.4. The application of future homeland mode and design

Based on the development of eco-agriculture landscape, future homeland project follows a harmonious and interactive development path with scientific agriculture, ecological farm, health resort, experience culture with the green technology as the driving force, ecological agriculture as support, tourism industry as agglomeration and cultural and artistic industry as soft power, forming an industrial system lead by four major industries, including agricultural cultivation, deep processing of agricultural products, tourism of ecological landscape and health resort, and cultural industry. Turning the development mode from agricultural development led by the primary and secondary industries into a new development path with primary industry, secondary industry and tertiary industry well-coordinated, a future homeland system has been built, interacted the advantages of agricultural science and technology, agricultural planting, deep processing of agricultural products, agricultural sightseeing, crops picking, tourism exhibition, garden culture, green food and health resort, etc. to cultivate a healthy and green industry chain, creating an ecological, scientific and exquisite industrial system with Chinese characteristics, contributing to the formation of model base of ecological agriculture for future homeland in Wuhan suburbs.

Design concepts include ecological harmony, maintaining the integrity of the park's natural ecosystem, respecting the natural properties of landscape vegetation, configuring the edible plants with the fine species of Wuhan city; circular economy, treating the resource flow of the whole park as a whole, establishing the eco-type recycling economy system based on resource recovery and recycling; green health, promoting green and healthy life with the establishment of ecology-friendly production system of edible landscape and the production and processing of agricultural products without chemical pesticides, chemical fertilizers, chemical preservatives and other synthetic substances or genetically engineered organisms and their products; intelligent technology, making full use of high-tech ecological garden technology with green soil and fertilizer, artificial fog, water purification, sewage purification system and the application of modern information technology, providing precision planting, visual management, intelligent decision-making on the grounds of emerging Internet, cloud computing and Internet of Things technology; low-carbon environmental protection, constructing the park with environment-friendly materials and technology to create low-energy, low consumption, low expenditure and other conservation-oriented production and lifestyle[24](Figure 3-4).



Figure3. Future Hall of Future homeland

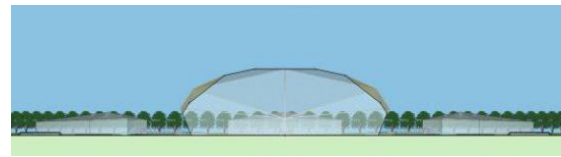


Figure4. Future museum profile

4. Conclusion

Eliel Saarinen once said: "The city is an opened book, from which you can see its ambition. Let me have a look at your city, I can find out the cultural pursuit of city residents." If we also treat the city as a book, then the eco-agriculture landscape is the preface of the book, representing expectations of various disciplines to the construction of most healthy and comfortable landscape. Urban residents are eager to have a pleasant space in public agricultural landscape. In this context, we must strictly follow the basic principles and ideas of ecological civilization and highlights the health care benefits with the most advanced technology available, thereby enhancing the happiness of the public[25].

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