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Research on the Construction of the High-efficiency Modern Agricultural Demonstration Park

Lilei Zhang[1], Shaowei Zhang[2] and Lifang Qiao[1*]

1. *School of Horticulture and Landscape Architecture, Henan Institute of Science and Technology, Xinxiang 453003, China*
2. *Henan Vocational College of Agriculture, Zhengzhou, 451450, China*

**Corresponding Author*
E-mail: qiaolifang2002@163.com

Abstract

The high-efficiency modern agricultural demonstration park is a new development mode of Chinese agriculture, and plays a very important role in promoting agricultural development. This paper establishes the framework of the modern high-efficiency agricultural demonstration park from six aspects, namely, development orientation, function composition, comprehensive planning, smart construction, standardized construction and innovation construction. The results show that these aspects are influenced by several factors or set up by several modules, and form the symbiotic network of the park. Positioning realistic development targets, arranging function division, allocating infrastructure, and integrating smart, standardized & innovative technologies will ultimately enhance the ecological, economic and social benefits of the park.

Keywords: *High-efficiency, Agricultural Demonstration Park, Smart, Industry*

1. Introduction

China is a developing country with the largest population in the world, but the area of farmland per capita in China is far lower than the world average level [1]. As a result, food security plays an important role in national security. Agriculture plays an important role in the national economy; however, for a long time, the production efficiency of agriculture in China has been low, and there are many reasons for this, among which the land system is one of the important factors. Since the policy of reform and opening up was carried out, China has launched the system of household contract responsibility [2], with farmers owning the right to use land and organizing production by themselves. In a certain period of time, this system worked efficiently in promoting peasants' enthusiasm for production, however, with the development of the economy and technology, the system's disadvantages began to become evident [3]. They manifested mainly in maladjustment between the socialized mass production and the organization, management, technology, resource utilization of the scattered small scale management pattern, resulting in much input, yet little output and low efficiency in agricultural production; The geographical dispersion and independent management are not conducive to the implementation of mechanized operation and updating agricultural science and technology; The quality of product is hardly to control; The standardization production technology can't be operated efficiently; and the agricultural product do not have any competitive advantage. As an economic agent, single peasant household is unable to undertake the market risk, control the market dynamics and

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information, gain the competitive power. In China, agricultural development is facing very serious problems: The speeding up of urbanization leads to the huge reduction of agricultural acreage, threatening the grain output; the rapid growth of industrial water consumption leads to water resources shortage. At the same time, the reducing underground water level brings difficulties to agricultural irrigation; the rising price of agricultural labor force increases the cost of agricultural products; the requirement of the public on agricultural product quality is going up. The appearance of these problems puts forward to a higher requirement for agriculture development. Developing high-efficiency agriculture is the only way to meet the needs of the national agricultural development. To improve the efficiency and effectiveness of agriculture production, the road of scale production should be adhered to develop the modern agriculture. Large-scale operation can achieve the optimal combination of production factors, such as capital, technology and labor *etc.*, reduce production costs and enhance market competitiveness of agricultural products.

The Chinese government issued the management approach of operation rights transfer for rural land contracting, which opens a new route for the development of the modern agriculture demonstration park. In recent years, a lot of modern agriculture demonstration parks have been built in China. The modern agricultural demonstration park is a modern science and technology leading agricultural demonstration base which is based on modern science and technology, established in the requirements of local resource development and development of the leading industry, allocates production factors according to modern agriculture industrialized production and the operation system and manages scientifically [4]. In China national "Outline of Agricultural Science and Technology Development", it is clearly mentioned that, some agricultural science and technology parks shall be built nationwide, which conforms to the agriculture development trend in 21st century, and has strong driving effect and demonstration effect on the development of agriculture and rural economy of different regions.

However, owing to the lack of research in construction of agricultural demonstration parks, the blind construction of many parks has resulted in resource waste and economic loss. With the development of modern agriculture, agricultural biotechnology, information technology, resource and environment protection technology etc. have played an increasingly important role in the construction of parks. Therefore, it is a necessity to research the method of construction of modern agricultural demonstration parks.

2. Method

Modern agricultural demonstration parks should be constructed according to the basic principle of "Industrial agglomeration, fund aggregation, project concentration, benefit collectively showing". Modern high-efficiency agricultural demonstration parks construction framework should be established from six aspects, namely, development orientation, function composition, comprehensive planning, intelligent construction, standardized construction and innovation construction. Under the guidance of the construction framework, the park symbiotic network, which can optimize and adjust the spatial layout and composing structure, finally improve the comprehensive benefits of the park and promote the sustained development of the park (Figure 1), is constructed according to the role of the market mechanism.

3. Results

3.1 Development Orientation

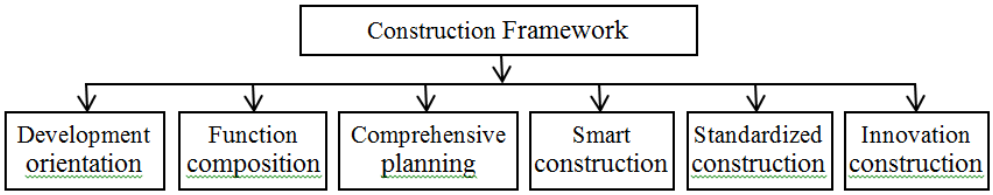

Figure 1. Construction Framework of Modern Agricultural Demonstration Parks

The development orientation is the premise of sustainable development of modern agricultural demonstration parks. The development orientation should be based on local economic development levels, locational conditions, characteristics of natural resources, the industrial development basis and fund situation, etc., and in line with the planning and layout of local leading industries, and conduct development centering on native featured agricultural products. The park ought to highlight its own advantages, and insist on the basic principles of "leading products, co-existence of multiple products, combination of long-term and short-term effects, and matching development".

3.2 Function Composition

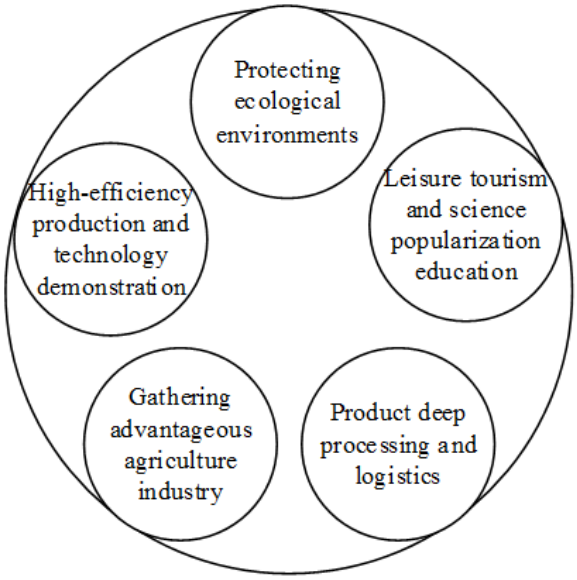

Figure 2. Diagram of Function Composition of Modern Agricultural Demonstration Parks

Modern agricultural demonstration parks shall have multiple functions. Except for mutual coordination and promotion among different functions, building multiple functions is one of the effective methods to withstand marketing risks and increase benefits. Normally, high-efficiency modern agricultural demonstration parks have the following functions: protecting ecological environments, and reducing the impact of pesticides and chemical fertilizers, *etc.*,

on the environment through efficient production; gathering advantageous agriculture industry and giving a full play to the scale and benefit of intensive production; Function of high-efficiency production and technology demonstration. The productive efficiency is improved and promoted by introducing new varieties, matching technologies of production, information technology and ecological cycle technology, *etc.*, Function of leisure tourism and science popularization education, namely, satisfying the public's demand for tourism and leisure through developing leisure agriculture and popularizing scientific knowledge; Function of product deep processing and logistics (Figure 2).

3.3 Comprehensive Planning

Comprehensive planning refers to the comprehensive assignments and implementing measures of the properties of the parks, the development goal, the development scale, land use, spatial layout as well as all construction, and it is an important insurance of healthy development of the parks.

3.3.1 Function Division: The purpose of dividing functions of the agricultural park is to reasonably arrange the functional positions such as production, management, leisure and logistics, and form an interrelated organic whole with a reasonable layout. Each functional area should be relatively independent and keep in touch with each other. Function division can have a variety of ways: according to the production process, it can be divided into the nursery area, plant area, processing area, etc.; It can be divided into the open-field planting area, greenhouse area and culture area and so on according to product categories; according to functional categories, it can be divided into the high-efficiency production area, science and technology research and development area, management area, leisure and entertainment area.

3.3.2 Infrastructure: The park's infrastructure is an important guarantee for the efficient functioning of the park, which mainly includes: transportation facilities, pipe network facilities, production facilities, leisure facilities and landscape facilities *etc*., Traffic facilities planning shall be convenient for organizing production, and reduce the traffic interference of various functional groups as much as possible. In addition, the need to organize leisure tourism routes shall be taken into consideration; Pipe network facilities include water supply, irrigation, drainage, electric power, network, lighting and other facilities; Production facilities include the intelligent greenhouse, sunlight greenhouse, livestock farm, storehouse, cold storage, inspection center, information center, distributor *etc.*, Leisure facilities include the visitor center, parking lot, catering accommodation *etc.*, Landscape facilities include landscape architecture, sculpture oddments, symbols, rest facilities *etc.*

3.4 Smart Construction

The development of information technology provides the technical support for the modern agriculture [5], and many techniques, including precision agriculture, intelligent irrigation, water-saving irrigation, intelligent surveillance and so on, have been widely used in modern agricultural production. The intelligent agriculture is the advanced stage of agricultural production, setting the emerging Internet, mobile Internet, cloud computing and the Internet of things technology as a whole, relying on the implementation and deployment of all kinds of sensor nodes and wireless communication network on agricultural production site, realizing intelligent perception, intelligent early warning, intelligent decision and intelligent analysis for agricultural production environments, providing precision planting, visual management and

intelligent decision for agricultural production [6]. Intelligent agricultural parks can be designed according to modular methods. Modular design is a method that classifies and designs a series of functional modules on the basis of analysis of different functions within a certain scope or the information with the same function but different performances so as to meet the requirements of different users. Upon analysis, modern agricultural demonstration parks can be made up of the following intelligent modules (Figure 3).

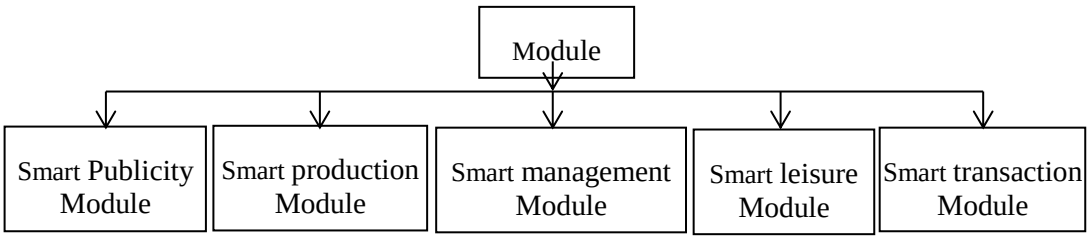

Figure 3. Diagram of Composition of Smart Modules of Modern Agricultural Demonstration Parks

3.5 Standardized Construction

Agriculture standardization refers to the establishment and implementation of standard systems in links of pre-production, in the production and post-production, mainly including the standardization of production environments and standardization of the production process and techniques of agriculture. Agricultural standardized demonstration parks refer to agricultural production parks in which the production and management are organized according to certain planting or breeding standards, the products of which reach the relevant quality standard requirements and which have played a demonstration and leading role in the surrounding areas. Standardization construction needs standard bases and related checkout equipment, personnel and organizations, and needs to complete the input records before production, process records in production and processing records after production. The products of standardized production should obtain the authentication of related inspection organizations and have the traceability function to meet the market demand and consumers' demand (Figure 4).

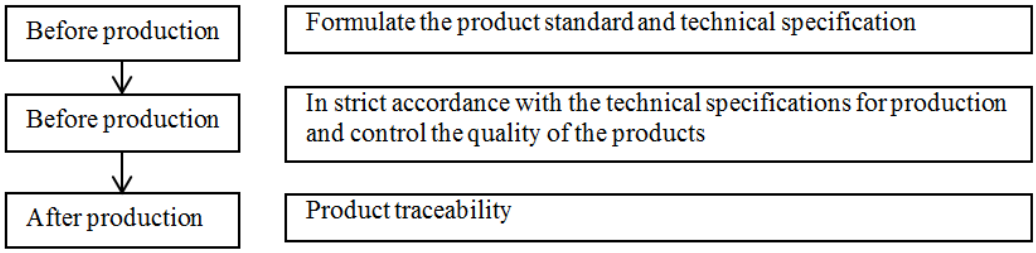

Figure 4. Diagram of the Standardized Construction of Modern Agricultural Demonstration Parks

3.6 Innovation Construction

Modern agricultural demonstration parks should advocate self-dependent innovation to put the innovation resources into use to the largest extent and to promote the marketization of the innovative products more quickly. Innovation agriculture can give play to the superimposed effect of such innovations as the technology, brand, mode of production, business model,

market mechanism *etc.*, [7] Innovation of the business model: in the aspect of management, actively introduce modern enterprise systems to realize corporatization and enterprise operation, and build flexible efficient mechanism of the park's construction; In light of funds, multi-channels and multi-layers investment and financing mechanisms should be set up and the investment channels should be expanded; Innovation of production technology: facilitate the upgrading of the industry, improve the production technology and promote the ecological environment protection and utilization of resources by improving independent innovation ability; Brand and service innovation: obtain the corresponding trademark rights through relevant quality certification to increase market awareness, so as to obtain higher economic benefits. Gradually set up the service system integrating scientific research, agricultural parks, special farmers' cooperatives, bases and farmers.

4. Conclusion

The modern agricultural demonstration park is of significant importance in facilitating the adjustment of agricultural structure and industry upgrading. The park should have the features of bright regional characteristic, high technological content, complete infrastructures, innovative operation mechanism and obvious radiative effect to fully play the role of demonstration parks to push forward technological innovation, promote the development of the industry and increase the income of the farmers. Positioning realistic development targets, arranging function division, allocating infrastructure, and integrating intellectual, standardized and innovative technologies will ultimately enhance the ecological, economic and social benefit of the park.

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Authors

Lilei Zhang, female. She received a bachelor degree from Henan Agricultural University, Zhengzhou, China, in 2000, now she is a lecture in the School of Horticulture and Landscape Architecture, Henan Institute of Science and Technology, Xinxiang, China. Her current research interests include the landscape planning and design. E-mail: 366893563@qq.com.

Shaowei Zhang, male. He received a bachelor degree from Henan Institute of Science and Technology, Xinxiang, in 2006, now he is a lecture in the Henan Vocational College of Agriculture, Zhengzhou, China. His current research interests include the landscape planning and design. E-mail: 806378876 @qq.com.

Lifang Qiao, female. She received a M.S. degree from Central South University of Forestry and Technology, Changsha, China, in 2004, now she is an associate professor in the School of Horticulture and Landscape Architecture of Henan Institute of Science and Technology, Xinxiang, China. Her current research interests include the landscape evaluation and the application of mathematical models in landscape optimization. E-mail: qiaolifang2002@163.com.