

Discussion on the Current Situation of Flower Equipment Production and the Promotion of Equipment Production Technology

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Abstract: Along with the vigorous development of the economy, mechanized production has gradually become a trend in the growth of the floriculture industry. Both domestic and international sectors are gravitating toward adopting advanced mechanized production methods to enhance production efficiency and product quality. Our country has also begun to explore and establish a comprehensive mechanized production system that adapts to market demands and technological advancements. However, due to limitations such as superficial research and limited technical levels, our nation's floricultural mechanized production still requires improvements in areas like intelligence and equipment. To further advance the development of mechanized production technology in floriculture in our country, this paper conducts an in-depth analysis based on the current state of mechanized floriculture production both at home and abroad. It discusses strategies for advancing mechanized production technologies. Through this research, it aims to provide valuable references and suggestions for the furtherance of mechanized floricultural production technology, thereby driving the sustained and healthy development of our country's floriculture industry.

Keywords: Flower Industry; Flower Equipment Production; Intelligence; Production Equipment; Equipment Production Status

1. Introduction

Flower equipment production involves the application of advanced greenhouse technology, water and fertilizer integration system, automatic irrigation equipment and

biological control methods in the flower production process to achieve the goal of mechanical automation and intelligence of the production process. However, at present, China's flower equipment production still faces some problems, such as low technical level, insufficient equipment, low production efficiency, etc. There is still a certain gap compared with developed countries. Facility horticulture operation equipment is the executor of equipment production, the embodiment of intelligence, and the collector of information production data, and the guarantee of large-scale production efficiency and quality [1]. Facilities and equipment are important means and methods for the flower industry to achieve intensification, modernization and intelligence, and they play a key role in promoting the transformation and upgrading, innovative development and high-quality development of the flower industry. Therefore, it is necessary to conduct in-depth research on the current situation of flower equipment production and strengthen its production technology promotion, which is conducive to improving the technical level and market competitiveness, and is of great significance for promoting the development of the flower industry.

2. Research Status at Home and Abroad

2.1 The Current Situation of Foreign Flower Equipment Production Technology and Equipment

With the improvement of the modernization level of facility horticulture production, a large number of facilities horticulture modern production equipment manufacturers have emerged in the Netherlands as the core, including the Dutch Visser company and the Dutch Flier Systems company, the Italian

Mosa company which mainly produces planters, and the Netherlands. Jova in the Netherlands and Mayer in Germany are the main producers of matrix filling machines; Ellegaard in Denmark and Techmek in Italy are the main producers of fabric matrix bowls; TTA in the Netherlands, DaRos in Italy and TEA in Italy are the main producers of potted flower and seedling transplanting machines. Codema, Van Zaal and WPS in the Netherlands, which produce logistics production systems for horticultural production facilities, and Aweta in the Netherlands, which mainly produce vegetable and cut flower grading equipment. The products of these companies are not only used in Europe, but also sold all over the world, and some products have been introduced in China[2].

Some developed countries have developed advanced equipment facilities for flower production. In the country of the Netherlands, for example, horticultural facilities are an important pillar of its economy. There are large multi-story glass greenhouses and a high degree of automation. And the flower industry has complete companies and perfect infrastructure; Japan is a world leader in horticultural facilities, and the main products it produces include vegetables, flowers, and fruits. At present, its widely used horticultural facilities are mainly plastic greenhouses, and they have a world-class advanced level of equipment and environmental regulation technology in greenhouses; flower planting accounts for more than half of the greenhouse area in the United States, with advanced equipment, first-class production level, various types of greenhouses, and fully automatic facility cultivation technology; Israel is in a world position in terms of water-saving irrigation, making full use of the advantages of local light and heat resources in the process of facility production, and the irrigation and planting technology is first-class.

2.2 The Status Quo of Domestic Flower Equipment Production Technology and Equipment

At present, China's flower and horticulture industry has not yet reached a high degree of specialization, and its production technology and technology also lag behind. As a result, the industry has limited competitiveness in the

international market. At the same time, through the analysis of relevant data, it can be shown that most of the current horticultural flower production enterprises in China are farmers, and only 40% are large-scale enterprises, which leads to a small scale of horticultural flower production due to the dispersion of the main body, and it is difficult to form a large production benefit [3]. China's first plastic greenhouse was born in 1965, and plastic film covering technology was introduced in 1978. With the development of the economy, the cultivation area of multi-story greenhouse horticulture in China has been expanding in recent years, especially after 2012, and the growth rate has increased significantly, as shown in Figure 1. Although the area of greenhouse horticulture in China is growing rapidly, there are deficiencies in terms of technical content, stability, informatization, intelligence, and logistics equipment [4]. As of March 2016, of the 5,060 active patents in facility horticulture, there was a significant increase in the proportion of patents related to equipment and equipment. In particular, patents in the four categories of energy conservation, structure and machinery, irrigation, and control increased at the highest level since 2013. According to the same size, the overall situation of facility horticulture in 2017 is relatively good (see Table 1.). Based on the comprehensive assessment of the five key steps of cultivation, sowing, harvesting, irrigation and environmental control, the mechanized level of facility gardening reached 33.12%, an increase of 1.34 percentage points compared with 2016. In 2022, the total planting area of horticultural flowers in China reached 1.05 million hectares, accounting for more than 1/3 of the total planting area in the world. Although the area of flower planting in China is large, the production is not centralized, the scale of production is small and the benefit is low. From the comparison between the current level of mechanization and industrial demand, the demand for equipment upgrading is very urgent. Whether it is the hardware of the greenhouse facility itself or the software of the production equipment production system, China's facilities and flowers must go through the road of mechanization, automation and intelligence. The key is to base on independent innovation and have a "Chinese core"[5]. It can be seen

that China's flower equipment production technology to get a certain progress, but also still need to promote the development of production technology.

Table 1. List of Facility Horticulture in 2017

category	Area (10,000 hectares)	Proportion (%)
Total area of facility horticulture in the country	204	100
Area of mechanized farming facilities	150	74
The area of the machine broadcasting facility	34	17
Area of machine mining and transportation facilities	18	9
Area of mechanical irrigation and fertilization facilities	115	56
Area of mechanical environmental control facilities	52	25

Note: "Total Area of National Facility Horticulture" indicates the total area of national facility horticulture in 2017. The rows from "Area of Mechanized Farming Facilities" to "Area of Mechanical Environmental Control Facilities" represent the area of each facility and its proportion in the total area of facility horticulture in the country.

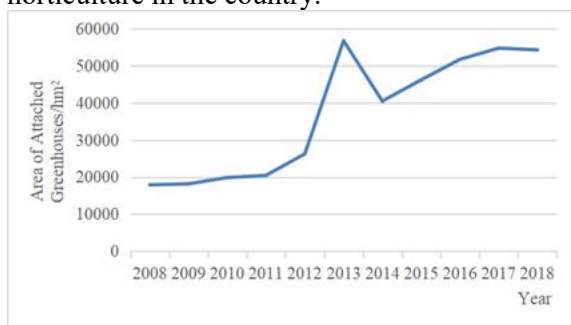


Figure 1. Changes in the Planting Area of Multi-Story Greenhouses in China in Recent Years.

Source: China Facility Horticulture Information Network

The number of new greenhouses in the country is also increasing, and the types of facilities in

China are diversifying. According to the report, in 2022, the total area of new greenhouses in the country will be 2,699.13 hectares, of which plastic film greenhouses have the largest area. See Figure 2. .

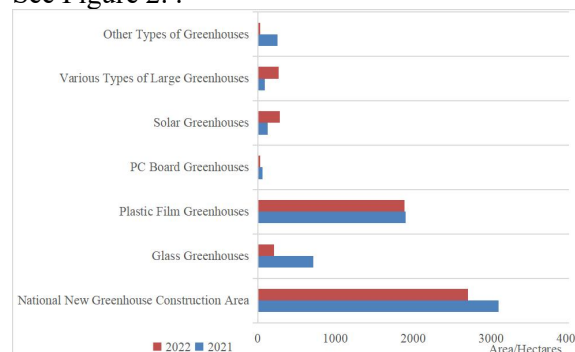


Figure 2. The Area of New Greenhouses and the Area of Various Types in China in 2022.

Note: Source: Richland Sources® Released the "2021 And 2022 National Greenhouse New Area Statistics" Report

The multi-story greenhouse is to ensure the intelligent, equipped, informational, and equipped production of facility horticulture, which is a trend in the development of horticultural production technology [6]. Facility horticultural production is a new modern agricultural production method that has emerged in recent years, which is to provide water, light, temperature and humidity for plant growth through the establishment of artificial environments, such as greenhouses and greenhouses. In order to replace or improve the natural environmental conditions, to achieve high yield and high quality of production crops. Through a controllable production system, this production method reduces the influence of crops from external environmental factors, improves the stability and production efficiency of crop growth, and usually requires high input and professional technical management.

Since the mid-90s of the 20th century, China's facility horticultural equipment technology has begun to be applied, but compared with developed countries, there is still a certain gap. The development of key aspects of mechanized production, such as tillage, irrigation and fertilization, has been uneven. Although China continues to introduce new technologies and equipment from the world, it still faces the problem that the speed of technology promotion is not fast enough.

In China, some large-scale flower planting enterprises have begun to introduce international advanced flower production equipment, such as the introduction of flower seedling transplanting machine from the Netherlands, the introduction of paper bowl machine from Denmark, and the introduction of quality mixer and substrate filling machine from Germany. In addition, some super-large facility horticultural production enterprises have even introduced complete equipment systems from the Netherlands. The introduction of these advanced equipment will help to improve the technical level of facility horticultural production in China, and provide a strong technical demonstration and guidance for China's facility equipment production, and promote the process of flower equipment production in China. In addition, some medium-sized facility horticultural planting enterprises are facing increased demand, increased labor costs, and limited funds. In order to alleviate these problems, some enterprises try to design and manufacture simple production devices and conveying and logistics devices by themselves, but because the design of these systems is relatively simple, lack of sufficient systematization, and low transportation efficiency, they are not suitable for large-scale production.

3. Characteristics and Existing Problems of Flower Equipment Production Technology and Equipment at Home and Abroad

3.1 Characteristics of Flower Equipment Production Technology and Equipment at Home and Abroad

The production process of seedling equipment includes substrate treatment, substrate filling, precision sowing, seedling cultivation, and seedling replenishment. Foreign developed countries have developed advanced paper bowl machines for substrate treatment, as well as matrix filling machines, precision seeding machines, conveying logistics and other equipment production equipment.

Compared with the traditional manual matrix treatment, the use of paper bowl machine for matrix processing has more advantages, the use of this equipment for matrix batch mixing and continuous mixing of high production efficiency, high degree of automation, matrix disturbance is small, but the investment cost is

high. In addition to foreign countries such as Denmark's paper bowl machine, China also has Dongguan Enzhuo paper bowl machine; The traditional manual matrix filling operation has low production efficiency, high labor intensity and poor working environment. The traditional manual operation speed is 30-60 seconds/disk, while the filling machine operation speed is 5-10 seconds/disk, which is more than 6 times the manual operation speed; The types of precision seeders include drum type, needle type, and plate type. The operation of the drum seeder is high-speed, complex and has certain limitations; the needle seeder has strong adaptability, but the production efficiency is not high; the structure of the flat seeder is simple, the price is low, and the production efficiency is also low; The equipment production of fresh cut flowers includes seedling transplantation, cultivation of cut flowers, harvesting, grading and packaging. The roses in the Netherlands adopt a logistical planting mode, in which rose rock wool is soilless cultivation and rose rock wool cultivation mobile seedbed. Grading, bunching, stem cutting, bundling production line: first, the cut flowers are manually put on the machine, and then the machine carries out bunching, stem cutting, and bundling operations on the cut flowers, and then the conveyor system conveys the cut flowers, and finally the packaging machine packs.

3.2 Issues

According to the above content, it is known that there are the following problems in the equipment production of flowers in China: First, the equipment production equipment is mainly relatively simple, the degree and level of the facility environment can be controlled and the level is low, and the level of equipment production technology is low, which needs to be further improved. Second, the scale of equipment production is small, mainly individual production, labor intensity, and low production efficiency. The third is to pay attention to product quality while focusing on production efficiency. Fourth, the research on flower equipment production technology is relatively shallow, and the standardization system has not yet been perfected.

4. The Promotion of Flower Equipment Production Technology

4.1 Appropriately Introduce Foreign Advanced Equipment to Produce Intelligent Equipment, and Learn from Advanced Equipment Production Technology

Optimize on the basis of the existing equipment, combine the specific local conditions, adapt measures to local conditions, take the essence and remove the dross. According to the local production demand, the key equipment is introduced from abroad. Organize the team to study the working principle and technical characteristics of foreign advanced production equipment, and combine the local environmental characteristics, such as climate, soil, etc. and working conditions to optimize and improve the technology of the introduced equipment. For example, local production is unstable due to climate change and soil conditions. Through the introduction of an intelligent agricultural monitoring system, combined with local climate and soil data, the system can monitor these data in real time and adjust production parameters, effectively improving crop adaptability and yield.

4.2 Strengthen Personnel Training, Improve Production Efficiency, and Reduce Labor Intensity

Strengthen the training of intelligent talents for equipment production equipment, and improve the technical level, such as carrying out relevant skills training. Increase capital investment in production equipment research and development to attract more technical talents. For example, a special R&D fund has been set up to support enterprises and individuals in R&D and innovation of production equipment. Actively encourage the application of computer systems, Internet technology, big data and other modern science and technology to carry out technological innovation. For example, man-machine coordination control technology, through the remote control of intelligent information on the Internet, reduces the flow of personnel management, and greatly improves the operation efficiency; Another example is substrate cultivation: by combining sensors and intelligent control systems with substrate cultivation, automatic monitoring and control of environmental factors such as temperature, humidity, and light can be realized, making the

cultivation process more accurate and efficient. Intelligent substrate cultivation systems can also improve the quality and yield of plant growth through learning and optimization algorithms [7].

4.3 Increase Investment in the Research and Development of Flower Equipment Production Technology, and Establish and Improve the Standardization System

According to China's national conditions and characteristics, the government should introduce relevant policies to support and plan the research and promotion of flower equipment production technology. And increase investment in the research and development of flower equipment production technology, and encourage scientific research institutions and enterprises to carry out technological innovation. Establish and improve the standardization system of flower production equipment, and formulate unified technical standards and operating specifications. For example, in important areas of flower production, the government has introduced a series of policies to encourage technological innovation and equipment production in the flower industry. Through the establishment of a special fund, we will support enterprises to develop new intelligent flower planting equipment suitable for China's flower production needs. Through the establishment of a standardized system for flower planting, all aspects of flower production have been standardized, and standardization and mechanization have been realized from planting, management to harvesting, which has significantly improved the yield and quality of flowers.

4.4 Strengthen Research and Cooperation to Achieve Optimal Allocation of Resources, Technological Innovation, and Industrial Transformation

In order to strengthen the research on flower equipment production technology, universities, scientific research institutes and enterprises can take the following specific measures to achieve the optimal allocation of resources and technological innovation: universities and scientific research institutes should have an in-depth understanding of industrial needs, and work closely with enterprises to ensure that research topics and industrial development

needs docking. The research results of universities and scientific research institutes need to be industrialized through enterprises to achieve mass production and market promotion. Scientific research institutes can be responsible for the development of prototypes, and use their scientific research advantages to carry out technical exploration and principle verification. Enterprises can establish a cooperation mechanism to jointly develop flower equipment to meet market demand. And through joint research and cooperation, strengthen personnel training, and provide talent support for the development of flower equipment production technology. For example, the university cooperated with local flower enterprises to set up a research project to develop an intelligent control system for the problems existing in flower production, which can automatically adjust the ambient temperature, humidity and light, and significantly improve the planting efficiency and survival rate of flowers.

4.5 Pay Attention to the Design and Development between Equipment Systems, and Establish a Sound System Development System

Develop a complete set of system integration plans to ensure that each system is compatible and works together in terms of technical architecture. The modular design approach allows each system to be developed and upgraded independently, while at the same time being easily integrated with other system modules. During the system development process, rigorous testing is carried out to ensure that the individual system modules are working properly and to optimize the system performance. Pay attention to user experience design to ensure that the system interface is friendly and easy to operate. Based on user feedback and market demand, the system is continuously iterated and upgraded to meet changing production needs. Facility horticulture management is based on crop growth control model and crop data collection and diagnosis, and the growth status information of crops is sensed and regulated in a unified manner [8]. For example, in the production process of flower production enterprises, through the establishment of a unified data management platform, the flower planting management system, irrigation

control system, pest monitoring system and other systems are integrated, the centralized management and efficient use of data are realized, and the production efficiency is greatly improved.

4.6 Encourage and Support the Popularization and Application of Equipment Production Technology, Reflecting the High Level of Equipment Production Technology

Based on the image processing and recognition algorithms, the perception layer of the facility horticulture management system is established, and the characteristic parameters of crops and plants are obtained, which can accurately realize the precise control of facility horticulture management and lay a theoretical foundation for the promotion of precision agriculture[9]. Combined with the development of regional characteristic crops, the government has introduced relevant policies to encourage and support the popularization and application of equipment production technology. Promote the optimization and upgrading of facility horticulture technology, based on the actual situation of the development of the facility horticulture industry, carry out the transformation of operating conditions from the characteristics of local industries, reserve the corresponding operating space and operating conditions, and help facility horticulture to achieve personalized growth and transformation. In this way, agricultural machinery and agronomy can be perfectly integrated, and agronomists can use a large number of advanced technologies in crop cultivation and management, reasonably adjust planting processes and models, and optimize facility horticulture intelligent equipment based on relevant parameters, forming a new facility horticulture productivity [10]. In addition, a demonstration project of equipment production technology will be established to demonstrate the actual effect of new technologies and equipment through on-site demonstration and trial operation. It is also necessary to strengthen technical training for peasant households and enterprise employees to improve their understanding and operational ability of equipment production technology. It is also necessary to guide the flow of resources to the field of high-efficiency agricultural

equipment through the market mechanism, and promote the survival of the fittest in equipment enterprises. For example, the government has introduced a series of measures to encourage farmers and enterprises to adopt advanced equipment. By providing financial subsidies, the use cost of farmers and enterprises has been reduced, and a large number of agricultural equipment has been popularized and applied. The government has also established an agricultural equipment demonstration park, a variety of advanced agricultural equipment and technology. Through on-site demonstration and trial operation, farmers and enterprises can intuitively understand the actual effect of new technology and equipment.

4.7 Supervise and Manage the Investment of Social Funds in the Field of Flower Equipment Production Technology

Formulate and improve relevant laws and regulations, and establish special regulatory agencies or designate relevant institutions to be responsible for the supervision and management of social funds in the field of flower equipment production technology. In addition, investors and users are required to regularly disclose information such as project progress and the use of funds, so as to improve investment transparency. It is also necessary to establish and improve the risk prevention and control mechanism to predict and prevent the risks that may arise in investment projects to ensure the safety of funds. For example, the government can set up a special investment regulator to supervise and manage the investment of social funds in the field of flower equipment production technology. The agency conducts a rigorous evaluation of investment projects to ensure their feasibility and effectiveness, and conducts regular reviews of the use of funds in the investment process.

5. The Development Trend of Flower Production Equipment

The state has clearly emphasized that agricultural development needs to rely on modern equipment and technology to promote the modernization of agricultural production and the improvement of product structure, while promoting green production and industrial innovation, and strengthening the

role of science and technology in agriculture. Intelligence is an advanced stage of the development of the facility flower industry, and it is also the comprehensive result of the level of social and economic development and scientific and technological capabilities on the facility flower industry [11]. Facility horticulture is an important field for scientific adjustment and innovation of agricultural technology structure, and it is an important method to improve the comprehensive competitiveness and production efficiency of facility horticulture by carrying out operation and production equipment [6]. Traditional flower production can not meet the market demand in time, and equipment production can greatly improve production efficiency. From this point of view, the equipment production of flowers is an important development trend of the flower production industry.

The development trend of flower production equipment is mainly reflected in the following aspects:

First, automatic and intelligent: with the advancement of technology, flower production will increasingly adopt automation and intelligent equipment, such as intelligent greenhouse control systems, automatic irrigation and fertilization equipment, etc., to improve production efficiency and quality. The use of various advanced equipment, such as the use of satellite positioning, drone monitoring, Internet of Things and other technologies, to achieve precise management of flower planting, can improve production efficiency and reduce labor costs, such as precision fertilization, irrigation and pest control, to reduce resource waste and improve yield and quality. The second is to pay attention to green development: in the process of flower production, we should pay attention to the protection of the environment and ecological balance, and adopt more environmentally friendly production methods, such as organic fertilizers, biological control, etc., to reduce environmental pollution. The use of advanced intelligent information management system for management work, to promote the sustainable development of China's flower industry. The third is data-based decision management: through big data analysis and decision support system, growers can better understand the data change trend in the production process, make more

scientific and reasonable decisions, and improve production efficiency and economic benefits. Through these data-based management system equipment, the smooth operation of China's flower production process can be further promoted.

6. Conclusion

Through the introduction of foreign advanced facilities and technology and research, China's flower equipment production has achieved certain results. However, at present, China's flower equipment production is still facing problems such as low level of equipment production technology, low degree of equipment, low level of intelligence, and low production efficiency, and there is still a certain gap compared with developed countries. The introduction of specialized advanced equipment production facilities, in the flower equipment production mechanization, intelligence, automation and other technologies to gradually establish and improve the standardization of flower equipment production processes. On the basis of the standardization of this equipment production, we will further strengthen the research and innovation of equipment production technology, further improve and promote the production standardization, and optimize and improve according to the specific actual situation of China's flower equipment production and the introduction of foreign advanced facilities, so as to promote the development of China's flower equipment production technology.

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