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Étude sur la situation actuelle et les perspectives de développement de la chaîne d'approvisionnement en fleurs du Yunnan en Chine à l'ère post-épidémique

Study on the Current status and Development Prospects of Yunnan Flower Supply Chain in China in the Post-Epidemic Era[1]

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Résumé : En prenant la chaine d'approvisionnement de l'industrie chinoise des fleurs comme thème de recherche, nous étudions dans cet article le statut actuel et les perspectives de développement de la chaine d'approvisionnement des fleurs représentée par la Province du Yunnan par la méthode de comparaison de données. Ce papier analyse de façon détaillée la situation actuelle du développement de l'industrie de fleurs dans la Province du Yunnan selon les trois aspects de la production, du commerce et de l'exportation, montre en même temps les problèmes existants dans le développement de la chaine d'approvisionnement de l'industrie des fleurs dans la Province du Yunnan et avance les stratégies et les suggestions pour le développement futur de la chaine d'approvisionnement de l'industrie des fleurs dans la Province du Yunnan.

Mots-clés : Chine ; industrie floricole ; chaîne d'approvisionnement ; ère post-épidémique.

Abstract : Taking the supply chain of China's flower industry as the research theme, we study the current status and development prospects of China's flower supply chain represented by Yunnan Province through the method of data comparison in this paper. This paper analyzes in-depth the current situation of the development of the flower industry in Yunnan Province from three aspects of production, trade and export, at the same time points out the problems existing in the development of the supply chain of the flower industry in Yunnan Province and puts forward the strategies and suggestions for the future development of the supply chain of the flower industry in Yunnan Province.

Keywords: China; Flower Industry; Supply Chain; Post-Epidemic Era.

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1. Introduction

Yunnan Province in China is one of the world's top three emerging flower production areas, where the largest fresh-cut flower trading market in Asia and the second largest in the world is located. The fresh-cut flower market share in China is more than 70 % (Kong, Zhu, Qin, & Yan, 2021). According to People's Daily Online Exclusives, every day, 120 categories, more than 1,600 varieties and about 30 million fresh-cut flowers enter the market for trading, connecting nearly one million flower growers and florists.

China's fresh-cut flower trading market, represented by the Kunming Dounan International Flower Industrial Park sold from 9.2 stems of fresh-cut flowers with a turnover worth of 7.436 billions yuan ($1.02 billion) in 2019 to 11 billions stems of fresh-cut flowers with a turnover worth more than 12.1 billions yuan ($1.67 billion) in 2022 *(Data from People's Daily Online Exclusives).* Flower industry in Yunnan province (hereinafter referred to as "Yunnan flowers") has been the top in Chinese exports for many years. The foreign markets include Russia, Japan, Australia, Southeast Asia and other 40 countries and regions.

Although the production and sales of the Yunnan flowers still dominate the development of the domestic agricultural economy after the impact of the Covid-19, there are still a series of problems, such as small scale of production, lack of planning in purchasing, and imperfect logistics system, compared with the Netherlands and other European countries. Aiming at these problems, our study proposes suggestions and strategies for the development of China's flower supply chain in the post-epidemic era from the three dimensions of research and development (R&D), production and trading.

2. Analysis of the development of the Yunnan flower industry

2.1. Production of Yunnan flowers

Yunnan Province, located in southwest of China, has unique topography and climate conditions that are favorable for plant growth. Such favorable natural conditions make Yunnan become a representative of "biodiversity", the production and varieties of flowers are both the microcosm of this "diversity". After more than 20 years of development, Yunnan has gradually formed a relatively reasonable distribution of flower industry products from a geographical perspective: The northwestern region gathers the production of bulbous flowers, forming a planting base specializing in breeding and fresh-cut flowers; the central region mainly focuses on the production of temperate cut flowers; the southern region mainly focuses on the production of tropical orchids as well as indoor foliage plants; the northwestern region centered on Shangri-La of Diqing Prefecture is a production base of bulbous flowers, with a planting area of 4,000 mu (≈ 266.67 hm^2); the Xishuangbanna, Yuanmou and other tropical regions have a flower production bases covering an area of 5,000 mu (≈ 333.33 hm^2); Kunming, the capital of Yunnan, has established a production base of 1,000 acres for orchids and potted flowers (*Yang,M.Y.,2021*).

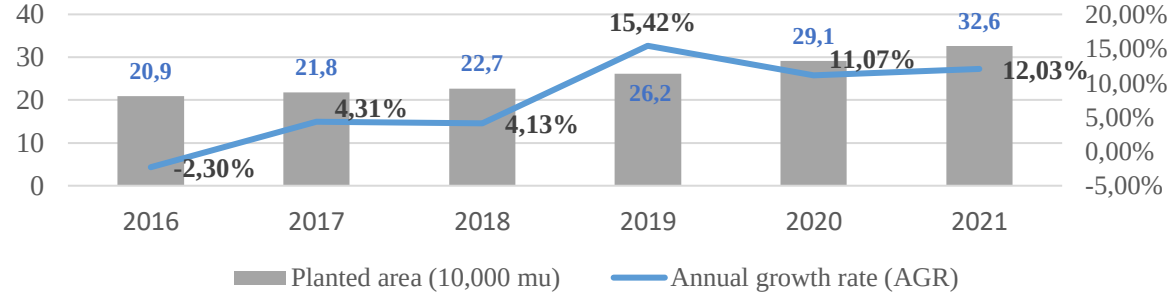
According to data from the Department of Agriculture and Rural Development of Yunnan Province, between 2001 and 2020, the number of flower farmers in Yunnan province increased from 76,000 to 200,000, the number of flower farmers' cooperatives (a type of organization that provides growers with services such as financial support, sales, and warehousing) increased from 103 to 499. In 2020, the income of flower farmers in the province reached 4.2 billions yuan ($0.58 billion), in 2021, it reached 6.18 billions yuan ($0.85 billion), with a year-on-year increase of 47.14 %. By 2021, there were 7,950 flower enterprises in Yunnan Province, including 6 national key leading enterprises and 36 provincial key leading enterprises *(Liao.Z.X et al.,2023)*.

Yunnan Province's key advantageous products as fresh-cut flowers and potted flowers, their planting areas were 210,000 mu (14000 hm^2) and 90,000 mu (6000 hm^2) respectively, up 4.3 % and 6.2 % from 2015 respectively. The output of fresh-cut flowers was 11.03 billion stems, an increase

of 96 % compared with last year, with an output value of 9.24 billions yuan ($1.28 billion), with an increase of 34.7%; the output of potted flowers was 330 millions pots, with an increase of 24.3 % compared with last year, with an output value of 8.78 billions yuan ($1.21 billion), with an increase of 1.5 % compared with last year (*Source from Yunnan Province Flower Industry Development Report in 2021*).

The production value of fresh-cut flowers in Yunnan Province of China rose year by year from 2016 to 2021and the scale of the industry continued to expand. In 2021, the planting area of fresh-cut flowers in Yunnan reached 326,000 mu, while the production scale basically remained stable under the influence of the global epidemic (see Figure 1.). In 2017 and 2019, the production value of fresh-cut flowers in Yunnan Province grew relatively fast, with the growth rate reaching 9.64 % in 2017 and 22.01 % in 2019. (See Figure 2.)

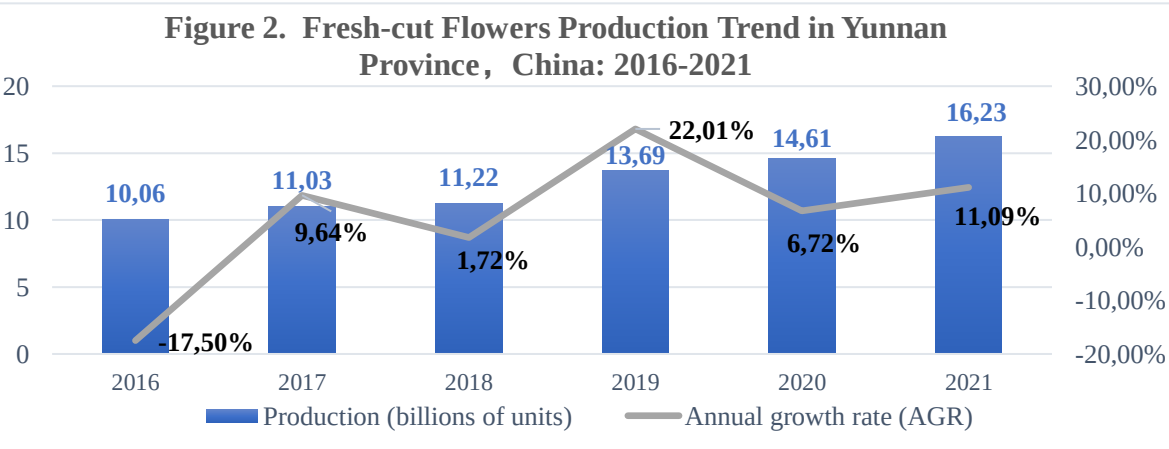
Figure 1: Trend of Fresh-cut Flower Planted Area in Yunnan Province, China: 2016-2021



Source: China Flower Association, Yunnan Provincial Federation of Flower Industry, China Statistical Yearbook

The Yunnan flower industry has been able to develop continuously, on the one hand, is attributed to the suitable climate and effective government support in Yunnan Province, which provide a favorable development environment for the industry. On the other hand, due to the rapid development of floral e-commerce, which promotes the rapid development of the fresh-cut flower industry in Yunnan Province.

Figure 2. Fresh-cut Flowers Production Trend in Yunnan Province, China: 2016-2021



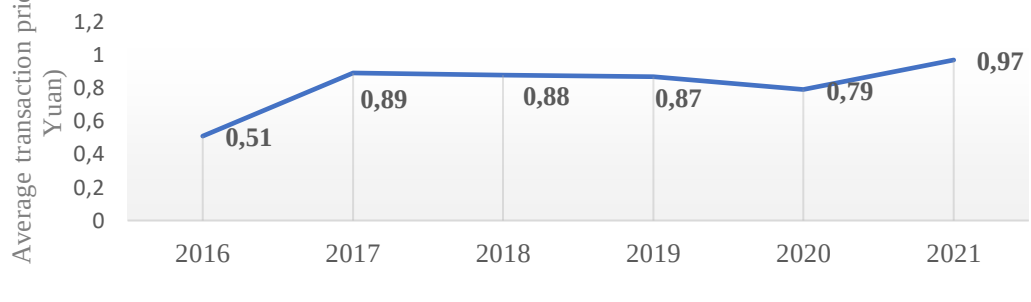
Source: China Flower Association, Yunnan Provincial Federation of Flower Industry, China Statistical Yearbook

2.2. Trading of Yunnan flowers

In 2021, the output value of Yunnan flower reached 40.63 billion yuan ($5.61 billion), with an increase of 4.1 % year-on-year; the output value of the flower agricultural products processing industry reached 52.487 billion yuan ($7.24 billion), with an increase of 145.7 % year-on-year; the

added value of wholesale and retail sales reached 10.31 billions ($1.42 billion). The ratio of processing output value to agricultural output value was 1.29:1（*Data from People's Daily Online Exclusives*). The average unit price of fresh-cut flowers in 2021 was 0.97 yuan per stem, with an increase of 22.8% year-on-year (see Figure 3.).

Figure 3. Trend of average transaction unit price of fresh-cut flowers in Yunnan, China: 2016-2021



Source：Yunnan Province Flower Industry Development Report in 2021

The current trading mode of China's flower market is dominated by four types of transactions: counterparty transactions, auction transactions, e-commerce platform transactions and futures transactions *(Qin, Chen, & Ma, 2015)*. With the wide application of the Internet, the trading mode of the e-commerce platform is gradually improving and developing, however, due to the lack of mature market supervision and logistics and transportation systems, the current trading mode of flowers in China's flower market is still dominated by auction trading and counterparty trading.

In Yunnan, most of the counterparty transactions take place in the Dounan bulk wholesale market. After the flowers are picked, they are immediately processed in the field and then transported to the wholesale market. The day's transactions are usually completed overnight to ensure that the freshest flower products reach the retail market the next day. Bulk buyers, however, prefer the auction model of trading, with about 36 % of Yunnan's bulk flowers being traded through auctions *(Qin et al., 2015)*.

The Kunming International Flower Auction Center (KIFA) and the Doonan Flower Auction Electronic Trading Center (DFETC) in Kunming, the capital of Yunnan Province, are two of the largest flower auction centers in China, which, like the Amsterdam flower auction market in Holland, use a "Dutch-style reduced-price auction" model *(Zheng, Zhang, & Song, 2020)*. In contrast to the stock market's upward trading model, the auction centers offer to "buy down". The auction clock in the auction hall shows the name of the grower, the number of products, product name, the price on the auction clock from high to low jump, the bidders press the auction clock button on the seat, the computer will record the trader's information and data, a transaction can be closed. Today, nearly 5 million flowers are sold every day at an average rate of one transaction every four seconds.

2.3. Exports of Yunnan flowers

At present, the global flower industry has formed a large pattern of production and marketing separation: Europe, the United States, Japan, China, the Middle East and other countries are the world's major consumer of flowers, while the Netherlands, Yunnan of China and the four equatorial countries (Kenya, Ethiopia, Ecuador, Colombia) is the main producer *(Pradas G I. et al.,2023)*

The implementation of the Chinese government's "One Belt & One Road" initiative and the signing of the RCEP agreement have made Yunnan a bridgehead for China's opening up to the southwest, as well as an international corridor connecting South and Southeast Asian countries

(Hua.Y.R.,2021). Nowadays, the partial opening of the Trans-Asian Railway, the increase of air routes, the construction of Yunnan Pilot Free Trade Zone and cross-border e-commerce platform have optimized the international trade environment of Yunnan flowers and created favorable conditions for Yunnan flower exports.

According to the statistics of China Customs, the export value of fresh-cut flowers from Yunnan Province rose year by year during 2017-2021, and the export value of fresh-cut flowers from Yunnan Province in 2021 was USD 64,330,500, accounting for 53.16% of the national export value of fresh-cut flowers (see Table 1.), ranking the first among all the provinces in China.

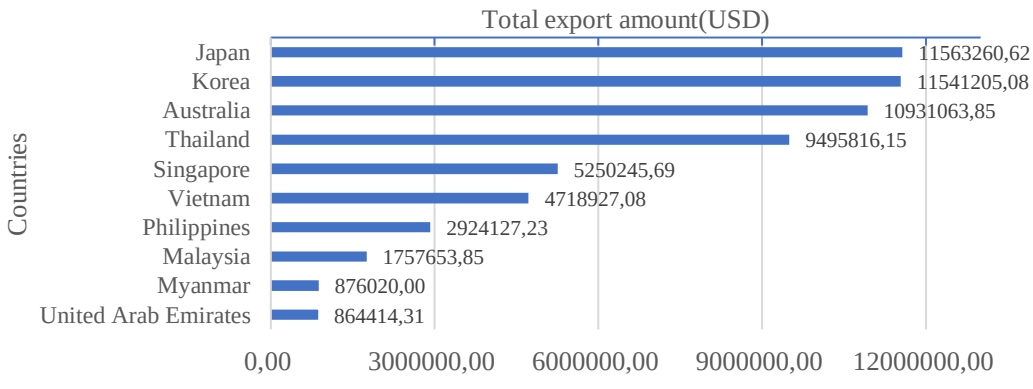
Table 1. Flower Export Value Share in Yunnan, China 2017-2019

Item	Year	Thailand	Other South-East Asian countries	Countries and regions except South-East Asia
Proportion of flower exports to total exports in Yunnan,China	2017	14%	53%	33%
	2018	11%	29%	60%
	2019	33%	33%	34%

Source: China Customs Statistics

Yunnan flowers have been exported to 40 countries and regions in Asia, Europe, America and Oceania, and the international market share is increasing year by year. In addition, Yunnan has a geographic center location to South Asia, Southeast Asia, West Asia, while connecting the Indian Ocean and the Pacific Ocean (*Dong.Y,2019*), flowers have been exported to Thailand, Singapore, Malaysia and other countries and regions in the early days. Later, with the improvement of the quality of Yunnan flower products and the steady expansion of production, flowers are exported to Japan and South Korea and other countries with more stringent import requirements (see Figure 4.).

Figure 4. China's Top 10 Fresh-cut Flower Exports by Country and Amount, Jan-Nov 2021



Source : China Customs Statistics

3. Realities and challenges in China's flower supply chain

After thirty years of development, Yunnan flower industry ranks first in China in terms of industry scale, market supply, variety and market coverage. In recent years, the upgrading of flower consumption has promoted the householdization and daily consumption of flowers. The huge consumption potential of flower in China will continue to drive the rapid development of Yunnan's

flower industry. Although, Yunnan has unique resource and industrial advantages in the fresh-cut flower industry, there are still some real problems and challenges in the fresh-cut flower supply chain from planting to distribution.

From the flower planting side, flower planting in Yunnan is basically a family-based small-scale planting, with an average area of about 20-50 mu planted by each flower farmer. *(Hua Yurui,2021)* Due to small-scale planting and decentralized production, it is impossible to form an intensive and standardized mode of flower production, while the application rate of commercialization technology in the origin is also relatively low. There is indeed a certain gap between the taste and quality of picked flowers and those imported from abroad. In Holland, the larger flower farms, basically using soilless culture technology, due to avoid contact with soil pests and diseases, flower cultivation technology and quality is better than China (*Ernesto Tavoletti & Robbin te Velde,2008*). In addition, China's flower varieties have been monopolized by foreign countries for a long time, and about 85 % of the varieties rely on imports. China's flower industry's foreign trade surplus mainly comes from importing flower seeds from abroad, then cultivating and planting them, and finally exporting finished cut flowers and flower arrangements. This also reflects a problem, China's flower industry lacks its own core technology, resulting in a trade surplus is mainly dependent on the province's excellent natural conditions, as well as a large number of cheap labor and cheap land formation, in order to obtain profits at the same time consume a large number of land resources and human resources.

From the side of flower circulation, fresh-cut flowers, as a typical representative of fresh agricultural products, have the following characteristics in the process of circulation itself: (1) not resistant to extrusion and easy to corruption; (2) shorter preservation cycle; (3) high transportation requirements; (4) low degree of standardization. These characteristics also determine that the operation difficulty of flower supply chain is higher than that of normal fresh agricultural products. At present, the main buyers in China's flower distribution chain are individual florist store owners, small wholesalers and e-commerce practitioners, who are numerous in number but dispersed in organization, with small purchase amounts and a lack of purchasing planning. Therefore, the characteristics of small-scale cultivation, production and supply of fresh-cut flowers in China and the unplanned small amount and multiple batch purchases by buyers create major uncertainties in the fresh-cut flower supply chain (*Zhu, Chen, Kong, & Qin, 2020)*.

In addition, flowers have high transportation requirements. Cold chain transportation is usually not used except in some exporting countries where there are special requirements for product quality or where bulk purchases are made by buyers and bulk transportation is required. In general, room temperature trucking and air freight are usually used, which cannot simultaneously ensure systematic temperature and humidity control of flowers during transportation while reducing transportation time.

The above issues pose challenges to the Chinese flower supply chain and contribute to the depletion of product value. The main challenges currently faced are twofold: first, the lack of scale and planning leads to inventory backlogs. Due to the small size of suppliers and buyers, product supply and demand are often unplanned and inventory turnover is slow (*Zhu et al., 2020)*, resulting in inventory backlogs and ultimately depletion. Second, the lack of reliable technical measures of production and logistics management leads to product loss. These technical management includes pest management in the planting and harvesting process, sorting and quality control in the processing and conservation process, and pick-up, export and transportation in the warehousing process. In particular, the flower e-commerce companies that sprang up during the global Covid-19 epidemic now have a large gap with some successful e-commerce companies in terms of big data processing, analysis and application due to the lack of accurate data modeling and analysis methods for planning and purchasing.

4. Recommendations and strategies for the development of China's flower supply chain in the post epidemic era

4.1. Building a joint R&D system to multiply the application of self-breeding varieties

We suggest that the government should take the lead in building the "International Flower Industry Science and Technology Innovation Center (STIC)" or other technological innovation organization. Through the innovation of management mechanism and cooperation mode, the STIC, local specialized planting enterprises and foreign breeding companies should form a stable new breeding consortium. In addition, flower producers as a source of products should establish comprehensive and specialized flower breeding bases, build joint R&D system and carry out cross-border joint excellent product selection and breeding *(Yasutaka N, 2018)*.

In additional, the activities as the introduction and screening of domestic and foreign flower varieties, the characteristics of flower resource discovery and utilization, biotechnology breeding, new varieties of breeding and industrial application should be supported. Finally, the introduction of high-level professionals, mergers and acquisitions of internationally renowned breeding enterprises or cooperation to realize the application of self-breeding varieties multiply should be incentivized.

4.2. Building a green production system and doubling the area under green production

Flower enterprises should control the key "quality" to facilities and equipment upgrading and transformation as support, while build green and efficient production technology system. Jinning District, Yunnan Province as a typical representative of the plateau lake area model, the government should support the establishment of international first-class green production demonstration bases and parks, and vigorously implement the fertilizer and water recycling soilless cultivation, green prevention and control technology and standards, so that the province's soilless cultivation, water and fertilizer recycling green production area to achieve a doubling of the area. In addition, it should further strengthen the zoning layout and design at the top level, reasonably guide and adjust the industrial structure, continuously improve the production efficiency and the proportion of high-quality flowers, realize the efficient use of resources and cyclical production, and ultimately promote the industry to improve quality and efficiency.

4.3. Building an efficient trading system to multiply the number of electronic transactions

The local government of Yunnan should further optimize the function of Dounan as China's flower trading and distribution center. At the same time give full play to the advantages of China's e-commerce, so as to make Dounan into a trading center of the "double-cycle" of international and domestic services for flowers.

In addition, enterprises can create the future economic model of flower e-commerce through the development of e-commerce live broadcasting, remote trading and other new trading modes, and build an efficient trading system and realize the multiplication of the number of electronic transactions. In terms of infrastructure construction, we can strengthen the research, development and application of intelligent flower production technology and supporting facilities and equipment based on information technology such as Internet of Things, big data, artificial intelligence, 5G network, blockchain and other information technology, so as to increase the level of informatization and intelligence of Yunnan's flower production. In terms of transportation and logistics, it is necessary to support and build a number of standardized terminal distribution centers and cold chain logistics systems in the main production areas of fresh-cut flowers, so as to solve the problem of "the first kilometer" of flower circulation and achieve the market goal of "selling more, selling higher and selling faster" for China's flower industry.

5. Conclusion

Yunnan issued a three-year action plan to promote the high-quality development of the flower industry (2022-2024) and accelerated its efforts to build its strength in the sector. Yunnan has achieved some initial results in creating a brand effect for its flowers and has seen a gradual increase in brand value and premiums. The province has also realized the integrated development of the flower industry, agriculture, culture and tourism.

Focusing on major floral products, technologies and business models, Yunnan is actively cultivating more new business forms and models of the flower industry, building an industrial chain that involves trade, logistics, and R&D of flowers, and integrating industry with tourism, culture and health.

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