
Analysis of Walnut Industry Development in Guangyuan Based on "Smiling Curve"

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Abstract: Based on the "Smiling Curve", this paper analyzed the promotion of walnut zonation plantation in Guangyuan, the advantages in the rapid increase of area, yield and output value, and the marketing promotion through technological innovations (e.g. selective breeding and pest control) and brand building. This paper revealed the fact that the walnut industry in Guangyuan had achieved remarkable results, but at the same time, some problems were still existing, such as low rate of improved varieties, focusing on planting but neglecting management, slow development of new main bodies, weak technology research and development in the industrial chain, fewer intensive processed products, changes in cost-benefit and consumption tendency, against which, targeted countermeasures were proposed: carrying out supply side reform of walnut industry chain, industry association + standard, learning from the experience of USA California Walnut Industry Association, strengthening functions of intermediary organizations, and establishing brand and quality monitoring system; increasing support efforts and innovating support mechanism, helping the cultivation of new-type business main bodies, and improving the quality of specialized cooperative organizations; insisting on variety improvement, and paying attention to tackling key problems in scientific research of industrial chain; walnut industry + internet, and combining the walnut forest and the tourism.

Keywords: Forestry Economics, Analysis of Walnut Industry Development, Smiling Curve, Supply-Side Reform, Guangyuan City

1. Overview of Walnut Industry Development

Guangyuan is one of the important walnut producing areas and the best suitable growing areas. Since 2000, the walnut industry has been promoted through the implementation of projects such as returning farmland to forestry, natural forest resources protection project and the construction of key modern forestry counties. In 2005, based on resources, the distribution of walnut industrialization bases was carried out, the input of science and technology was increased, the support of science and technology was improved, the new local walnut varieties were vigorously promoted, the forestry farmers were actively guided to adopt walnut product of better quality, and the development measures of walnut industrialization, such as the establishment of information network, were taken, thus allowing the gradual formation of the walnut industry. [1, 2] In 2009, "No. 1 Document" of the Central Committee of the CCP

made key arrangements and deployments for "accelerating the development of woody oil industry". In 2014, the General Office of the State Council issued "Opinions on Accelerating the Development of Woody Oil Industry". In 2015, the General Office of the Sichuan Provincial People's Government issued "Opinions on the Implementation of Accelerating the Development of Woody Oil Industry", putting forward that by 2020, we would strive to build our province into a strong province of woody oil industry, thus the industrial development ushered in significant historical opportunities. [3] By 2016, the fruiting area of Chaotian Walnut reached 91,500 hm², of which 60,400 hm² was relatively stable in yield; the output of walnut increased from 16,000 tons in 2006 to 142,000 tons, accounting for 29.4% of the total output of walnut in the province, ranking first in the province. The total industrial output value increased from 640 million yuan in 2006 to 6 billion yuan, and the per capita walnut income of farmers was over 2,000 yuan while the per capita walnut income of farmers in key townships reached

5,000 yuan, showing an obvious increase in income. In 2016, the processed fruit was 10,000 tons, achieving the output value of 1.2 billion yuan (see Figure 1). Three key leading enterprises of forestry industrialization at provincial level,

Tianhuangshan Walnut Food Co., Ltd., Bangren Food Co., Ltd. and Rongshengyuan Food Co., Ltd., had been cultivated, and Chaotian District had been built into a national walnut standardization demonstration zone.

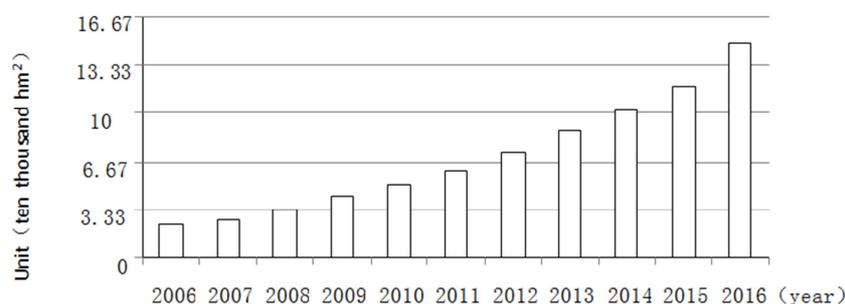


Figure 1. Statistical chart of the area of "Chaotian Walnut" base in Guangyuan over the years.

As to how to seize the opportunity and win the initiative in the global walnut development, and stand out in the fierce market competition [4, 5], this paper analyzed the development of "Chaotian Walnut" industry in Guangyuan with the "Smiling Curve" model and proposed corresponding countermeasures.

2. Analysis of the Two Ends of the "Smile Curve"

Smiling Curve is a theory put forward by Shi Zhenrong, the founder of Acer Group, in 1992, which focuses on R&D and marketing at either ends of the industrial chain of the "smiling" enterprises. The smiling mouth shows a curve, with both ends upward; in the industrial chain, the added value is more reflected in both ends, depending on scientific and technological innovation design and marketing, and the manufacturing added value in the middle link is the lowest. [6, 7]

2.1. Technological Innovation

In recent years, two provincial-level authorized improved varieties of "Shuoxing" and "Xiazao" and "Qingchuan No. 1" Wait for 3 and (totally 6 in the whole province) seven provincial-level certified improved varieties of and "Wanghe No. 2" etc. have been successfully bred in Guangyuan (see Table 1). The "Chaolin No. 1 A and B" forest pesticides have been developed. Grafting techniques such as dormant bud grafting, open-ground scion grafting and hotbed scion grafting have been actively applied to accelerate the improvement of walnut varieties, and national standards and regulations have been strictly followed in the production so as to improve the market competitiveness. Aiming at the high incidence of walnut weevil and silkworm moth in some villages and towns, Chaolin No. 1 Baoguoqing has been successfully developed, which has effectively solved the problem of walnut pests and largely increased the fruit retention rate and yield of walnut. In Chaotian District, the yield per plant of walnuts has increased from 1 kg in 1997 to 12 kg now, showing an obvious control effect.

Table 1. Statistical List of Improved Walnut Varieties in Guangyuan.

County / District	Number of improved varieties			Name of variety	Feature of variety	Suitable for
	Total	Authorized	Certified			
Lizhou District	1	0	1	Lifeng	Average fruit weight: 16.8g, shell thickness: 0.99mm, kernel percent (%): 50.17, crude fat (%): 62.54, crude protein (%): 22.19.	Fresh-eating and processed dairy product
				Shuoxing	Single fruit weight: 17.30 g, shell thickness: 1.38 mm, kernel weight: 9.40g, kernel percent (%): 54.3, crude fat (%): 69.5, crude protein (%): 12.1. The kernel is full, light yellow colored, and easy to get.	oil manufacture
Chaotian District	3	2	1	Xiazao	Average single fruit weight: 11.82 g, shell thickness: 1.1 mm, kernel percent (%): 51.9%, crude fat (%): 73.6, crude protein (%): 10.5. The kernel is full, dark yellow colored, easy to get, with fragrance and light astringency.	oil manufacture
				Shuchao 2	Average fruit weight: 17.6g, with degenerated inner wall and membranous diaphragms; shell thickness: 1.2mm, kernel percent (%): 52.83, crude fat (%): 64.28, crude protein (%): 20.70. The kernel is full, light-colored, fragrant, with longer carpodium. Single fruit weight: 11.1g, shell thickness: 0.89mm, kernel percent (%): 58.6%, crude fat (%): 66.58, crude protein (%): 19.33. The kernel is light yellow to milky white, with a fragrant but not astringent flavor.	Fresh- and dry-eating and processed dairy product
Zhaohua District	1	0	1	Zhaohu 1	Early fruiting, average single fruit weight: 16.7g, shell thickness:	Dry-eating
Cangxi	1	0	1	Qingxiang	Early fruiting, average single fruit weight: 16.7g, shell thickness:	Fresh-eating

County / District	Number of improved varieties			Name of variety	Feature of variety	Suitable for
	Total	Authorized	Certified			
County					1.0-1.1 mm, with degenerated inner wrinkle and membranous diaphragm membrane, the whole or half kernels can be taken, the kernel is full, and the inner seed coat is light yellow colored. Kernel percent: 53.0%, crude fat content: 59.24%, crude protein content: 19.01%; sweet and no astringency. Average single fruit weight: 21.4g, shell thickness: 1.2mm, kernel percent (%): 55, crude fat (%): 66.29, crude protein (%): 14.5. The kernel is easy to get, whole kernel can be taken, and the kernel is full, with fragrant mouthfeel.	
Wangcang County	2	0	2	Wanghe 1	Average single fruit weight: 13.2 g, shell thickness: 0.9 mm, kernel percent (%): 58, crude fat (%): 66.4, crude protein (%): 14.8. The kernel is full, seed coat is gray, with fragrance, easy to get kernels.	Fresh- and dry-eating
				Wanghe 2	Average single fruit weight: 14.2g, shell thickness: 0.94mm, kernel percent (%): 59%, crude fat (%): 71.3, crude protein (%): 17.3. The kernel is full and fragrant, especially suitable for fresh-eating.	Dry-eating
Qingchuan County	1	1	0	Qingchuan 1	Average single fruit weight: 17.28g, shell thickness: 1.3mm, kernelpercent (%): 50.17, crude fat (%): 62.54, crude protein (%): 22.19	Dry-eating and oil manufacture
Jiange County	1	0	1	Jianmen 1		Fresh- and dry-eating
Whole city	10	3	7			

2.2. Marketing Management

The brand strategy of walnut has been vigorously implemented to promote sales and increase added value. For example, "Chaotian Walnut" has been approved to implement the "protection of geographical indication products", and the Trademark Office of the State Administration for Industry and Commerce issued to it a certificate for the national geographical indication and a trademark registration certificate. In 2014, "Chaotian Walnut" was successfully established as a well-known trademark in China. In 2015, the State Administration of Quality Supervision and Inspection officially approved the expansion of the production area of "Chaotian Walnut" from 25 townships in Chaotian District to 170 townships in 7 counties and districts in Guangyuan, with the production area expanded nearly seven times, becoming the first national geographical indication protection product authorized for expansion of the production area in Sichuan Province, thus "Chaotian Walnut" has become the public card of Guangyuan walnut. In the first "Fruit Prince" competition held in Sichuan in 2014, "Chaotian Walnut" won the only gold medal in walnut category. Three provincial-level leading walnut deep-processing enterprises had been developed, and their processed products involved walnut milk, fresh walnut kernel, amber walnut kernel, snack food, and walnut oil, etc., with the designed annual production capacity of 50,000 tons and annual processing output value of 1 billion yuan, greatly improving the added value of walnut products. In 2014, Tianhuangshan Walnut Food Co., Ltd. was selected as "Top Ten Enterprises in China's Walnut Industry" jointly by China Economic Forestry Association and China Green Times. Its breast milk production technology applied to its product "Yeah Walnut Milk" obtained national patent protection. On July 14, 2015, Tianhuangshan Walnut Food Co., Ltd. was successfully listed in Shanghai Equity Exchange. The "Jianmen" brand walnut oil produced by Rongshengyuan Food Co., Ltd. has

been successfully established as a famous brand product and trademark in Sichuan Province. [2]

3. Existing Problems

3.1. The Rate of Improved Varieties in Base Construction Is Low, and the Supervision of Variety Quality Is Weak

In the early stage of walnut industry development, nonlocal varieties were introduced blindly. Especially because of the lack of thorough research on laws and regulations such as the Government Procurement Act, the Tendering and Bidding Law as well as the Seed Law, attentions were only paid to laws and regulations concerning tendering and procurement, but laws and regulations such as the Seed Law were not applied to strengthen the supervision of variety quality, and the variety of seedlings procured were of varying quality, resulting in prominent problems such as the disorder in current base varieties, low efficiency, no fruiting or less fruiting, thus increasing the pressure of later variety improvement.

3.2. The Phenomenon of Focusing on Planting but Neglecting Management Is Prominent and the Benefit Exertion Is Affected

The benefits of industrial bases are generally low, and the leading role of "helping farmers to increase income" has not been fully played. The main reason is that the forestry industry needs a long period of time for construction and output, and a large number of rural elite laborers go out to work, leaving mostly the elderly and children at home, so it is difficult to popularize practical production technology, which makes the daily management work of the forestry industry base unable to be carried out effectively, such as pruning and shaping, disease control and insect pest control, loosening soil and fertilizing, makes the means of production idle, and results in lack of scale effect and other phenomena. There is still a gap from the requirements of intensive, large-scale and modern management.

3.3. The Construction of the Institutional Team Is Lagging Behind, and Scientific Research and Technological Strength Is Weak

More and more new problems in industrial development need to be tackled through special projects. At present, there is not yet a set of mature scientific guidance technology for the development of walnut industry chain. The R&D of technical bottlenecks restricting industrial development, such as the increasingly serious harm brought by pests and diseases, is insufficient. The contradiction between the rapid industrial development and lagging scientific R&D has not been timely solved.

3.4. The Innovation of Business Mechanism Is Insufficient, and the Development of New-Type Main Bodies Is Slow

At present, the forestry industry in the whole city is still dominated by the small family production of thousands of households, the operation scale of specialized cooperative organizations is relatively small, the role of bonding is not strong, and there is a lack of innovative, scientific and effective mechanism for linking the interests of enterprises and farmers. [8]

3.5. Deep-Processed Products Are Few, and Leading Enterprises Are Limited in Driving Role

Walnut-based oil processing enterprises are in the primary stage of development, and the industrial chain is not long. Due to the problem of financial strength, the industry is dominated by family-based primary processing, so the annual processing volume is small, the scale is small, the equipment is simple, the management is extensive, the technology is backward, and the investment in new product R&D and market development is not enough, which leads to lack of intensive processing, low added value of products, weak market competitiveness and low market share. The industrial development pattern of leading enterprises driving bases, bases linking farmers, and production-processing-marketing coordinating has not yet formed. [9, 10]

4. Countermeasures and Suggestions

4.1. Strengthen Policy Support and Intermediary Organizations, and Establish a Brand and Quality Control System

We should formulate a groundbreaking implementation opinion on the development of the walnut industry, set up special funds for the development of walnut industry every year at the level of municipal finance, strengthen the integration of agriculture related projects, determine the work responsibility, strengthen the supervision and inspection and the target assessment, formulate development planning of walnut industry chain from high starting point, and support walnut industry to improve quality and efficiency and upgrade the products. More inclining policy supports should be given to projects in the aspects of

improvement of walnut varieties, construction of improved variety breeding system, practical technical training, intensive processing, construction of marketing system, brand creating and construction of quality safety system. During the international academic conference held in California in March 2014, the author inspected and tasted California walnuts. The United States is a major consumer of walnut, and the quality of California walnut is good. I was deeply impressed by the role of California Walnut Association in walnut industry and walnut consumption. It is my suggestion that the walnut industry association of Guangyuan should be established, and the quality of walnuts in Guangyuan should be further improved so as to win consumers' favor and market share and promote the growth of walnut industry in Guangyuan.

4.2. Innovating the Support Mechanism to Facilitate the Cultivation of New-Type Business Main Bodies

We should foster and set up forestry industry development investment company and build investment and financing platform in leading enterprises and professional cooperatives, and use policy-based investment funds to promote industrial development, industrial fund project approval, and financial discounts, etc. We should seize the great opportunity for the reform of the rural property right system to accelerate the reform of the forest tenure system in the whole city, and through confirming the right of resources and ownership of assets, stimulate the vitality, promote the development of the industry to concentrate appropriately to major owners and experts and to conditional, powerful and capable managers, vigorously promote the "trusteeship" mode of assets (such as walnut trees) so as to form a "1+3" pattern that takes family forest farms as the main body and relies on farmers' professional cooperatives + industrial development leaders + social service supermarkets, and actively explore the mechanism of "household reformed into farm, farm admitted into cooperative, cooperative connecting with enterprise, and enterprise linking with market"; with the market demand as the guidance, the improvement of varieties and construction of standardized bases as the reliance, strive to improve the quality and output of walnut bases; with the domination of self management by the new-type business main bodies such as leading enterprises, specialized cooperative organizations, family farms and large-scale grower, drive the farmers to appropriately expand to a certain scale; with the aim of researching and developing deep-processed products, extend the processing chain, vigorously implement the walnut brand strategy, actively promote the development of walnut culture tourism, and unswervingly make a strong and excellent walnut industry. We should innovate technical training service mode, and build trading platforms and marketing networks; guide the new-type agricultural business main bodies to establish industrial associations or industrial alliances according to law, and cultivate a new walnut industry management system that forms "production cooperation, sales cooperation and credit cooperation."

4.3. Further Innovating the Development Model and Combining the Walnut Forest and the Tourism

We should promote the development strategies of integration of Guangyuan's walnut industry into the national "One Belt and One Road" and "Yangtze River Economic Belt", and expand the international and domestic markets. We should focus on brand building, and in accordance with the principle of "market oriented, with enterprise as the main body, government support, and professional operation", formulate the brand strategy plan and implement the mode of "public brand + enterprise trademark" so as to coordinate the brand construction, operation and protection. We should innovate the operating mechanism, guide the management rights of walnut woodland and forest and the fruit income rights to transfer to new-type business main bodies such as powerful specialized households, family forest farms, farmers' cooperatives and forestry enterprises, and promote moderate scale operation and intensive management. We should accelerate the establishment of walnut modern technical support system, set up Guangyuan Academy of Forestry Science, set up walnut production-teaching-research comprehensive laboratory, employ well-known domestic experts, and establish cooperative relations with universities. We should implement key projects, incorporate "Guangyuan Walnut Whole Industry Chain Integration and Development Project" into the provincial agricultural key projects, vigorously promote implementation in accordance with the requirements of standardized, large-scaled and cleaner production, support the development of walnut industrialized bases, promote the deep-processing of walnuts, build the China Chaotian Walnut Museum, build the plant of walnut special organic fertilizer, and build walnut e-commerce platform, etc.; through the integration of forest and tourism, develop walnut cultural industry, and build theme parks of walnut forest tour and walnut towns.

4.4. Insisting on Variety Improvement, Focusing on Scientific Research and Tackling Key Problems

We should support breakthroughs in the bottleneck of industrial development and key areas such as integrated pest control, soil testing and formulated fertilization and high-yield cultivation techniques. In accordance with the provisions of Articles 29 and 31 of the Government Procurement Act and the provisions of Article 15 of the Seed Law, we should make procurement from a single source. Grafting technical forces should be trained jointly by forestry and labor departments, sticking to getting on post by holding a certificate, and implementing the guidance of the government and the market-oriented operation. We should do a good job in the management of the well-established walnut fine seedling cutting orchard of 283.33 hm², so as to provide sufficient quality cuttings for variety improvement; make quality improvement for 6.700 to 10,000 hm² of the low-yield and low-efficiency walnut base every year, and strive to complete the quality improvement task by 2020. Research institutes and colleges and universities are the important soft power for a

place. According to the actual needs of the development of forestry industry in the whole city, we should employ well-known domestic experts, establish cooperative relations with colleges and universities, introduce relevant professional master students, integrate local business backbones and absorb native experts, so as to study and solve technical bottleneck difficult problems restricting the development of walnut industry in the city, and do a good job in practical technical training and promotion. [11]

4.5. Implementing the Supply Side Reform of Walnut Industry Chain and Walnut Industry+Internet to Promote Marketing

The supply-side reform of walnut industry is to start from the supply and production sides to enhance competitiveness and promote the growth of walnut industry. We should improve the quality of regional walnut, speed up the elimination of local disadvantaged varieties, and promote the walnut industry transformation and upgrading; establish a new marketing mechanism and actively explore the new marketing mechanism of "internet + forest products", and guide forest products distributors, specialized cooperatives and professional large households to carry out network sales.

5. Conclusions

The technology innovation and marketing analysis of the walnut industry chain at both ends based on the "Smiling Curve". Guangyuan City, one of the most important walnut producing areas and one of the best suitable growing areas, has been promoting the walnut zonation plantation, with the area, yield and output value increasing rapidly, and has achieved remarkable results in the walnut industry through technological innovations (e.g. selective breeding and pest control) and brand building. In view of such problems as low rate of improved varieties, ineffective supervision of variety quality, focusing on planting but neglecting management, weak scientific research and technical force, insufficient innovation of operating mechanism, slow development of new-type business main bodies, fewer intensive processed products and limited driving role played by leading enterprises, the author suggests that we should carry out the supply side reform of the walnut industry chain, industrial association + standard, learn from the experience of the California Walnut Industry Association, strengthen functions of intermediary organizations, and establish a brand and quality monitoring system; increase the support strength, innovate the support mechanism, help the cultivation of new main business bodies and improve the quality of specialized cooperative organizations; adhere to variety improvement and focus on scientific research in the whole industry chain; walnut industry + internet, and combine the walnut forest and the tourism; concentrate efforts on the two ends of the smiling curve so as to promote the growth of the walnut industry, and by 2020, strive to reach the targets of walnut production of 400,000 tons with the output value of 20 billion yuan, the per capita farmers of the city of 0.067 hm² walnut forest with the

per capita income of farmers from the walnut industry of over 10,000 yuan, realizing "win-win" of ecology and economy, as the saying goes that the "green waters and mountains are treasure houses".

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Biography



Wu Zhiwen, male, born in July 1966, graduated from Beijing Forestry University. He has been engaged in forestry for a long time. He is Senior Economist and Professor-level Consultant of Guangyuan Forestry and Garden Bureau, and is an expert with outstanding contributions in Sichuan Province. He has won 6 provincial and ministerial awards for science and technology, published more than 80 papers, with 4 papers collected by CAB, UK.