

Fresh Fruit Supply Based on Market Competition Model: Empirical Evidence from 14 cities in Guangxi, China

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This research investigates the competitive dynamics in the fruit industry across 14 cities in Guangxi, China, from 2012 to 2021. The study utilises the Boston Matrix market competition model, which emphasises two crucial indicators: market share and market growth rate. The findings unveiled clear market segments within these urban areas. The cities of Liuzhou, Yulin, Wuzhou, Fangchenggang, and Baise are classified within the dog market category, whereas Guigang, Baise, Hezhou, Hechi, Laibin, and Chongzuo are classified under the child market. The Star Market encompasses the cities of Nanning and Guilin, while the Cash Cow Market is exclusively represented by Qinzhou. Furthermore, this study examines the trajectory of market dynamics within each urban area. The fruit industry in various cities in Guangxi, China, exhibits a notable disparity, with a certain level of uniformity observed in the fruit supply across these cities. Consequently, it is suggested that efforts be made to improve orchard infrastructure and consistently advocate for the widespread adoption of professional planting and management practices to strengthen the growth and recognition of fruit brands.

Keywords: market competitiveness; fresh fruit industry; Guangxi; China

Introduction

The fruit industry in Guangxi, China, possesses substantial developmental advantages at the national level. According to [Xinhua News Agency \(2022\)](#), Guangxi has maintained its position as the leading region in fruit farming areas since 2016, with its production surpassing that of Shandong Province in China in 2021 ([China Statistical Database, 2023](#)). China places a considerable emphasis on the development of its agricultural sector. In order to facilitate the ongoing restructuring of its agricultural sector, the General Office of the State Council of China has issued the "Fourteenth Five-Year Plan for the People's Republic of China National Economic and Social Development and the Outline of Long-term Goals for 2035." This plan proposes the optimisation of agricultural production distribution through the establishment of industrial belts and advantageous areas for characteristic agricultural products. Additionally, it emphasises the importance of actively developing facility agriculture and expanding the forest and fruit industry, with a focus on adapting these initiatives to local conditions (CPGC, 2021) ([Xinhua News Agency, 2022](#)). Guangxi, recognised as one of the leading fruit production regions in China, boasts an annual fruit output of 10 million tonnes. This remarkable achievement can be attributed to the region's advantageous climate and geographic conditions, which facilitate a wide array of fruit varieties and substantial yields. Consequently, Guangxi has firmly established itself as a prominent province for fruit cultivation within the country ([Wang, 2022](#)). Furthermore, the geographical proximity of Guangxi to Vietnam affords it highly advantageous conditions for engaging in international trade with member countries of the Association of Southeast Asian Nations (ASEAN). According to [Jian and Nong \(2022\)](#), the Regional Comprehensive Economic Partnership Agreement (RCEP) in 2022 presented notable prospects for Guangxi

to enhance its level of openness and collaboration. The user's text lacks sufficient information to be rewritten in an academic manner ([Jian & Nong, 2022](#)). In the meantime, the fruit industry has emerged as a significant sector in Guangxi, contributing to its overall competitiveness and playing a crucial role in augmenting farmers' earnings, stimulating the economy of the industry, and fostering rural revitalization ([Qian, 2022; Zhang, 2022](#)). The user's text is already academic and does not need to be rewritten. The user provided a numerical reference ([Qian, 2022; Zhang, 2022](#)). Despite the practical significance of assessing the competitiveness of various fruit markets, there is a dearth of research studies that specifically examine market competition within the fruit industry. The research methodology outlined in this study has two main objectives. Firstly, it aims to evaluate the stability and growth prospects of the fruit industry through a dynamic analysis of market structures. Secondly, it seeks to identify and define different market segments within a particular region using a competitive framework. This segmentation approach facilitates the optimisation of market strategies for each distinct category. Therefore, the primary objective of this study is to examine the Guangxi fruit industry, specifically by analysing market competition trends across 14 cities in Guangxi. This analysis will be conducted by evaluating the market share and fruit production growth rates of these cities in order to determine their respective market positions and competitive trends. Furthermore, the objective of this study is to assess and analyse the current state of fruit development in different regions, develop optimisation strategies for various competitive situations, and provide valuable insights to facilitate informed decision-making in order to promote the high-quality growth of the fruit industry in Guangxi.

Literature Review

Scholars have employed qualitative and quantitative methodologies to examine the factors that impact competitiveness and the strategies employed for promoting the fruit industry. According to the findings of [Gül \(2006\)](#), a study conducted on 129 apple farms in Turkey, it was determined that apple production in units exhibits greater competitiveness compared to individual production. In their study, [Reginato, Carrasco, and García de Cortázar \(2008\)](#) focused on the peach industry in Chile and established a noteworthy correlation between planting density and orchard yields. The results of their study demonstrated a correlation between reduced crop yields and decreased planting densities. There is a need for the enhancement of orchard density design in order to improve competitiveness [Bakhshinejad and Hassanzadeh \(2012\)](#). conducted a study on Iran's primary agricultural products using the comparative advantage analytical approach. The research findings indicate that Iran does not possess a comparative advantage in the exportation of products such as apples.

However, it is suggested that Iran has the potential to increase its export capacity by enhancing its technological capabilities. [Lakner, Brenes-Muñoz, and Brummer \(2017\)](#) conducted a study on the technological efficiency of the agribusiness industry in Chile between 2001 and 2007. The findings of their research indicate that fruit companies in this sector would benefit from enhancing their industrial competitiveness by implementing scientific and technological advancements. In their study, [Bohdaniuk, Buriak, and Savchuk \(2019\)](#) employed questionnaires to survey crop producers and consumers in order to investigate the factors that are of utmost importance for improving the competitiveness of the fruit industry. The findings revealed that safety, quality, and environmental considerations in fruit production emerged as the top three priority factors.

In their empirical study, [Neves, Trombin, Marques, and Martinez \(2020\)](#) examined the industrial chain of Brazilian oranges over a span of 16 years. Their analysis aimed to identify the factors contributing to the growing consumption of Brazilian oranges in various countries and to propose strategies for optimisation. The formation of agricultural clusters for fruit and vegetable production in Uzbekistan was examined by [Urdushev, Eshankulov, and Mavlyanov \(2021\)](#). The study focused on analysing the geographical distribution of these clusters and the changes in export indicators over time. According to the findings of [Sokolov, Castornov, and Zhilyakov \(2021\)](#), the apple industry is currently facing an issue of overproduction. The researchers concluded that in order to enhance the competitiveness of their products in the market, producers should implement innovative approaches to industry development. [Kun, Yuenan, and Yingxue \(2021\)](#) employed Porter's Five Forces Competitiveness Model to conduct an analysis of the strawberry market in Dandong 99.

The authors put forth several essential strategies to improve the competitiveness of the organisation. These strategies encompass the development of a brand strategy, the strengthening of logistics infrastructure, and the optimisation of marketing channel strategies. In a study

conducted by [Zheng and Zhuang \(2015\)](#), the export trade characteristics of China's tropical fruits were examined. The authors analysed the comparative advantages and market share of these fruits and concluded that a majority of China's tropical fruits lack competitiveness, with a low growth rate in terms of their competitiveness. In a study conducted by [Lily \(2015\)](#), an analysis was conducted on the export competitiveness of fruits and vegetables in Zhangzhou. The study identified four key factors that influenced the growth of export trade. These factors encompassed the over-concentration of export markets, the rise in export finished products, the limited international competitiveness of regional brands, and the utilisation of a low-priced export mode. In a study conducted by [Hai'e \(2016\)](#), the market structure, behaviour, performance, and competitiveness of the apple industry in Gansu Province were examined using SCP and index analysis methods.

[Zhang, Tan, and Deng \(2017\)](#) conducted an analysis of the competitiveness of Guangxi's fruit industry using the "Porter Diamond" analysis model. Based on their findings, they proposed four strategies for improvement: promoting large-scale operations, emphasising quality, enhancing market competitiveness, and fostering innovation. Based on the findings of [Han, Niu, and Chang \(2021\)](#), the Yuncheng apple cluster's developmental trajectory encompasses several key strategies. These strategies involve enhancing the variety planting structure, elevating the standardisation level of apple cultivation, augmenting brand visibility, fostering the growth of leading enterprises, and establishing a contemporary apple industry system. In their study, [Wang and Cui \(2020\)](#) conducted a longitudinal analysis spanning from 2017 to 2019 to assess the progression of the fruit industry cluster in Shandong Province. The researchers employed concentration, competitiveness indicators, and factor analysis methods to evaluate the cluster's development. It was posited that there is a need for enhancement in both the degree and magnitude of commercialization within the fruit industry.

In their study, [Zeng et al. \(2021\)](#) conducted an analysis, calculation, and ranking of the competitiveness and concentration index of Yantai grapes, apples, and pears. The authors discovered that the location quotient index, scale comparative advantage index, concentration coefficient, and display comparative advantage index serve as direct indicators of the specialisation and scale of the fruit industry. Furthermore, these indicators are crucial for ensuring the industry's sustainable development. [Huang \(2006\)](#) conducted an analysis of the competitiveness of the fruit industry in Sichuan Province, employing the diamond model as a theoretical framework. The study utilised various indicators, including concentration rate, location entropy, display symmetric comparative advantage index, and comprehensive comparative advantage index. The findings revealed that enhancing the industry's competitive standing necessitates the optimisation of the planting structure, the enhancement of standardisation within the industrial chain, and the cultivation of distinctive brands.

In brief, a comprehensive examination has been undertaken regarding research methodologies, influential factors, and strategies for optimising competitiveness within the fruit industry. The primary focus of international research is on the theoretical and methodological aspects of the fruit industry's

competitiveness. In contrast, Chinese research predominantly focuses on conducting empirical analyses with the objective of identifying influential factors in the fruit industry's competitiveness and formulating practical strategies for optimisation. This research ultimately aims to address real-world challenges. Nevertheless, there is a scarcity of research regarding the competitiveness of the fruit industry in Guangxi, and the existing analysis is limited in terms of its examination of market competition.

By examining the distribution of market share within the fruit industry, one can gain insights into the market position and competitive dynamics across various regions. This analysis enables the prediction of the fruit industry's progress in different areas and facilitates the formulation of strategic plans to address competitive trends. Ultimately, this approach supports the advancement of the Guangxi fruit industry towards high-quality development. It is imperative to assess the regional challenges in Guangxi's fruit development and the distribution of fruit industries specific to each city. It is crucial to comprehend the prevailing challenges in the developmental process of the fruit industry in different regions, considering the current state of fruit development in Guangxi and the distribution of the industry across various cities. The evaluation of the industry's overall competitiveness carries practical significance.

Methods and Data

Boston Consulting created the market competition analysis technique in 1970 as a way to strategically plan enterprise product portfolios. This analytical approach utilises the market growth rate and market share as indicators of market attractiveness and company competitiveness. The application of this methodology to the fruit industry market enables us to assess the market position of each region, analyse the characteristics of market development, ascertain the potential for future market growth, and establish a reference framework for market development. The research on dynamic transfer in this model offers predictions regarding future market development trends and aids in the formulation of optimisation strategies. The present study employed the "Guangxi Statistical Yearbook" as a primary data source for information retrieval and analysis. The assessment of market share and growth rate for each city in Guangxi was conducted based on fruit production data spanning from 2012 to 2021. The subsequent step involved the construction of the Boston matrix model for each city in Guangxi in order to evaluate and analyse market dynamics that have transpired over the course of the past decade. Market share and growth rate were defined as

$$\alpha_i = \frac{X_i^t}{\sum_{i=1}^n X_i^t} \times 100\% \tag{1}$$

Market share:

$$\beta_i = \frac{X_i^t - X_i^{t-1}}{X_i^t} \times 100\% \tag{2}$$

Market growth rate:

Where α_i and β_i indicate the market share and market growth rate of the i -th fruit industry, respectively; X_i^t indicates i -th city's total fruit production within the t time-period; X_i^{t-1} indicates the fruit production in the i -th city in

the $t-1$ time period; $n = 14$; $\sum_{i=1}^n X_i^t$ indicates total fruit production in Guangxi during the t time-period. Using the average value of the fruit market share α and market growth rate β as the dividing line, the matrix was divided into four quadrants: star market, golden bull market, toddler market, and thin dog market in Guangxi's 14 cities. As shown in Fig. 1, the average value method for the market share and growth rate of fruit production in all markets over a t time period was used to calculate α and β (Huang, 2006; Porter, 1985).

$$\alpha^t = \left(\frac{\sum_{i=1}^n \alpha_i^t}{n} \right) \tag{3}$$

$$\beta^t = \left(\frac{\sum_{i=1}^n \beta_i^t}{n} \right) \tag{4}$$

where α_i^t denotes the market share of the i -th city in the t -th period; β_i^t denotes the market growth rate of the i -th city in the t -th period, with $n = 14$, representing 14 urban areas in Guangxi.

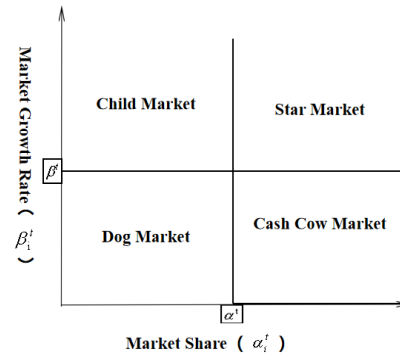


Figure 1: Types of market forms in a fruit system. Sources: The model is modified from the Boston matrix (Henderson, 1970)

Changes in the market pattern unveil the evolving dynamics within a specific market structure over a period of time. In a typical state, the external environmental conditions remain unaltered, and its progression adheres to the inherent dynamic transfer principle known as the "child market – star market - cash cow market - dog market." Figure 2 details the dynamic change.

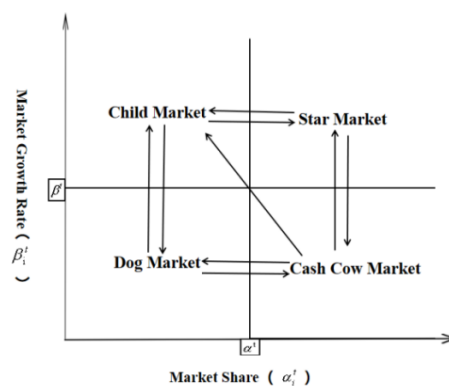


Figure 2: Types of market competition and their dynamic changes.

Results

Development of the fruit industry in Guangxi

In relation to the magnitude of progress observed in the fruit industry of Guangxi, there was a persistent upward trajectory in both fruit production and planting areas

within the region throughout the period spanning from 2012 to 2021 (Figure 3). The two curves exhibited a concurrent pattern of variation, indicating that there was a simultaneous increase in both curves from 2012 to 2015, followed by a simultaneous decrease from 2015 to 2016, and another simultaneous increase from 2016 to 2021.

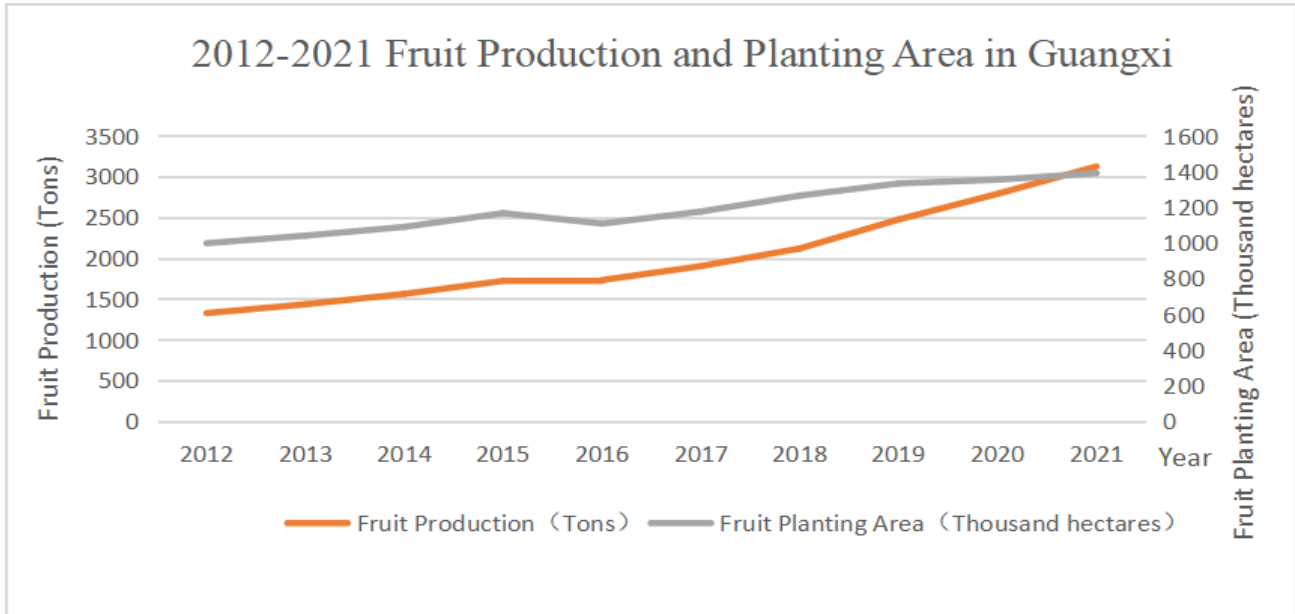


Figure 3: Guangxi fruit planting area and total production in 2012-2021
Source: Guangxi Statistical Yearbook (2012-2022)

In the year 2021, Guilin will emerge as the predominant area within the orchard regions of Guangxi, accounting for approximately 19% of the entire region. Bose, which constituted 13% of the district, followed closely thereafter. The main contributors to garden fruit production in the Guangxi region in 2021 were Guilin, Nanning, and Qinzhou, accounting for 32%, 16%, and 9% of the total regional output, respectively. The observable discrepancy in fruit production and orchard size across different cities in Guangxi province is apparent, displaying notable fluctuations within the observed intervals. In the context of

the fruit industry structure in Guangxi, it is evident that three primary products, namely citrus fruits, bananas, and mangoes, hold a significant market share. According to the data presented in the Guangxi Statistical Yearbook, it can be observed that in the year 2021, citrus fruits, bananas, mangoes, and Shatin pomelos demonstrated a production volume surpassing 1 million metric tonnes. Furthermore, the annual production of lychees and longans ranged from 600,000 to 1 million metric tonnes. It is worth mentioning that citrus oranges account for 50% of the overall fruit production in the Guangxi region.

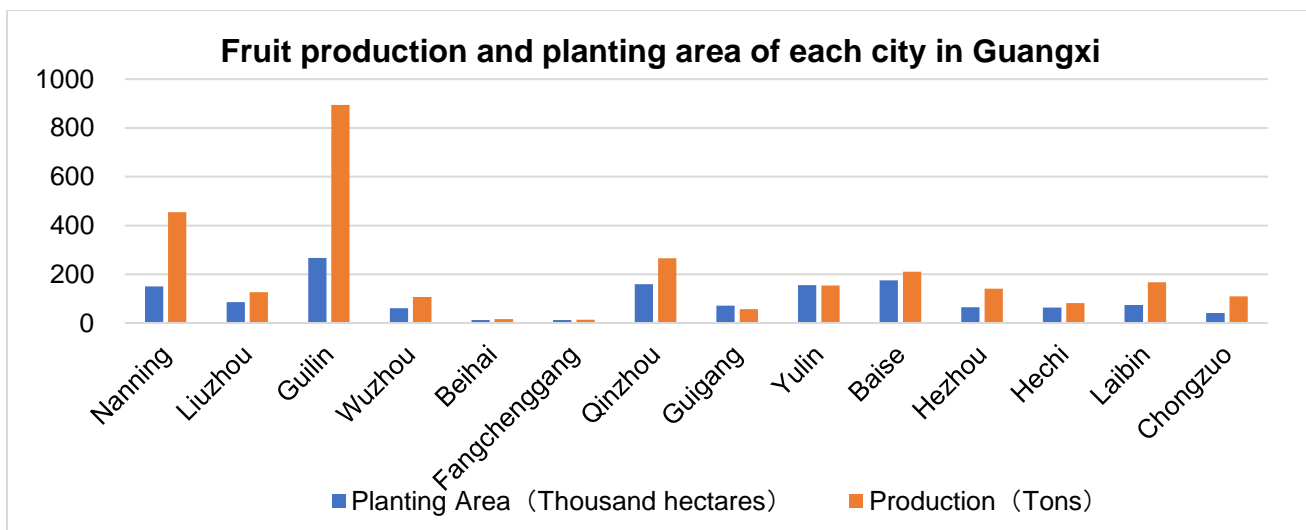


Figure 4: The area of orchards in Guangxi cities in 2021
Source: Guangxi Statistical Yearbook (2022)

Competitive situation of the Guangxi fruit industry

The data collected is subjected to analysis, wherein the evaluation of the average market share (α) and market growth rate (β) of fruit production in 14 cities in Guangxi is conducted

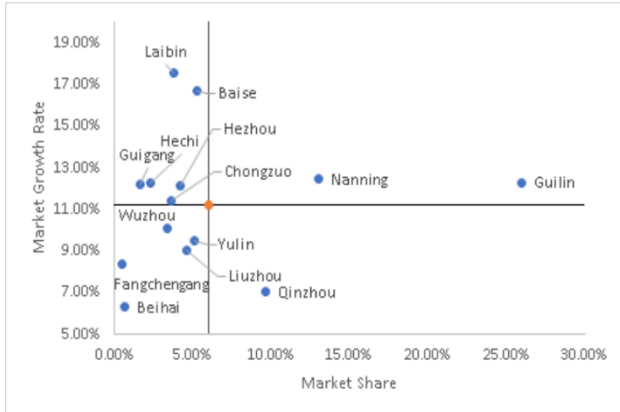


Figure 5: Market competition chart of the fruit industry in various cities in Guangxi

This analysis involves dividing the matrix into four quadrants using dividing lines as $\alpha = 5.98\%$, $\beta = 11.23\%$. The categorization of the fruit production market into four distinct groups can be inferred from the examination of Figure 5, which encompasses market share information, growth rate, and a scatter plot. This classification is outlined in Table 4.

Through an examination of icons, it has been ascertained that the Dog Market encompasses a total of five urban centres, namely Liuzhou, Yulin, Wuzhou, Fangchenggang, and Baise. Based on the data presented in Table 1, it can be observed that the growth of the fruit production market in four cities, excluding Beihai, exhibited a relatively stable pattern from 2012 to 2021, with no statistically significant deviations. The mean market growth rate surpassed 8%, whereas the market

share declined below the average, specifically at 5.98%. Among the entities under consideration, Fangchenggang exhibited the lowest market share, amounting to a mere 0.46%. In close proximity, Beihai demonstrated a slightly higher market share of 0.64%. In relation to the child market, it can be observed that the cities of Guigang, Baise, Hezhou, Hechi, Laibin, and Chongzuo demonstrated a comparatively diminished market presence. Nevertheless, the growth rates exhibited by the aforementioned entities exceeded the mean growth rate of 11.23%, thereby suggesting a substantial potential for expansion.

In contrast, the Star Market encompasses the cities of Nanning and Guilin, which function as dependable suppliers of fruit for the market in Guangxi. These cities exhibit the greatest market dominance within this particular context. At present, Guilin possesses a market share of 26.02%, suggesting a notable potential for growth. It is crucial to refrain from underestimating the significance of this potential. Simultaneously, Qinzhou holds the exclusive position as the primary cash cow market, securing the third highest fruit market share in the Guangxi region. Nevertheless, the rate of growth exhibited by this entity is comparatively moderate.

Table 1: Market pattern in each city of Guangxi (2012-2021)

Market Form	Standards	Source Cities	Market Form (%)
Dog Market	A < 5.98% b < 11.23	Liuzhou	(4.65, 9.01)
		Wuzhou	(3.36, 10.11)
		Beihai	(0.64, 6.3)
		Fangchenggang	(0.46, 8.39)
		Yulin	(5.13, 9.48)
Child Market	A < 5.98% b ≥ 11.23	Guigang	(1.61, 12.23)
		Baise	(5.29, 16.69)
		Hezhou	(4.18, 12.13)
		Hechi	(2.3, 12.24)
		Libing	(3.79, 17.54)
Star Market	A ≤ 5.98% b ≥ 11.23	Chongzuo	(3.62, 11.39)
		Nanning	(13.01, 12.44)
		Guilin	(26.02, 12.27)
Cash Cow Market	A ≤ 5.98% b ≤ 11.23	Qinzhou	(9.64, 7.02)

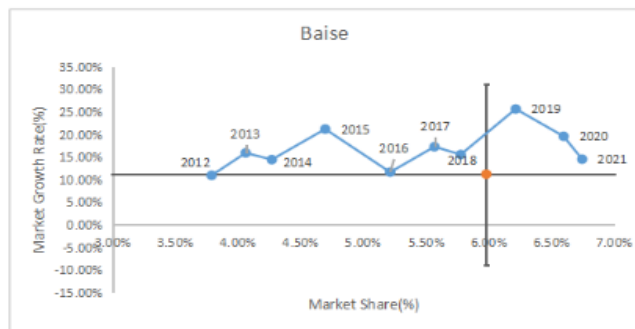
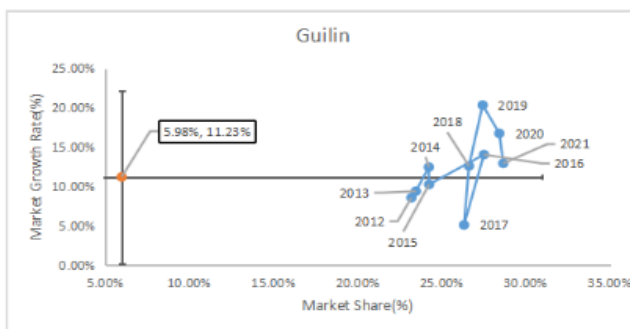
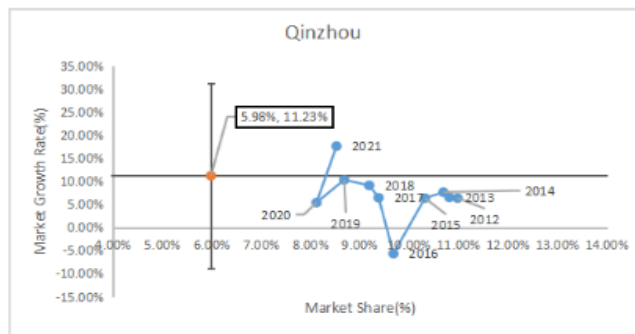
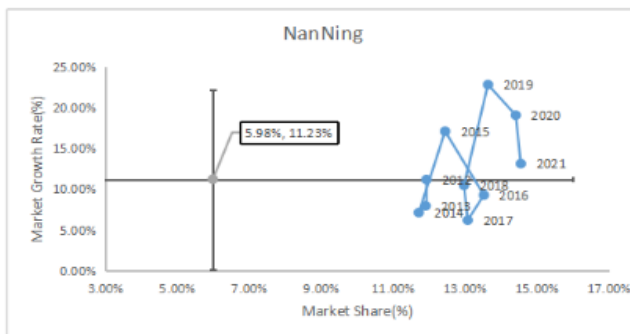


Figure 6: Market form changes in Nanning, Qinzhou, Guilin, and Baise

Dynamic change trajectory of the market form of each city

The study aimed to examine and analyse the fluctuating trends in the annual fruit production market patterns of various cities in Guangxi province between the years 2012 and 2021. Figure 6-8 depicts the trajectory of the fruit yield market form for each city, based on the average classification criteria of 5.98% and 11.23%. The subsequent analysis demonstrates the following alterations. Over the course of more than ten years, Nanning has undergone a gradual transformation from being a market with high profitability to becoming a market with significant growth potential and increased prominence. The formulation of a fruit development strategy known as the "one centre, two sectors" approach has been a result of the recent adaptation of Nanning to its local conditions. This strategic approach places significant emphasis on the prevailing fruit variety sector and aims to facilitate the expansion of three key industries, namely banana, orah mandarin, and dragon fruit. The banana is a fruit that holds significant cultural importance, originating from the region of Nanning. The agricultural geographical denomination "Nanning banana" has been officially registered. The orah mandarin industry in Nanning has experienced significant growth, encompassing 60% of the planting area in Guangxi and one-third of China's total orah mandarin cultivation area. Additionally, the dragon fruit industry in Nanning stands out for its adherence to strict standards and commitment to producing top-notch goods. In 2019, the observed rate of expansion in the Nanning market was twice the fundamental threshold. Although there has been a modest decrease in the rate of growth in fruit production within the market, there has been a notable rise in its market share.

From the period spanning 2012 to 2021, Guilin has consistently upheld a substantial market dominance in the domain of fruit production within the Guangxi region. Since the year 2017, fruit production in Guilin has constituted approximately 25% of the overall fruit production in the Guangxi region. The prominence of Guilin's fruit planting area, which accounts for approximately one-third of the entire Guangxi region, has consistently positioned it as the leading producer in the area. The interdependence between the fruit industry's market dynamics in Guangxi and the extent of fruit cultivation in Guilin is evident. In the year 2017, Guilin encountered a notable decrease in its market growth rate, ultimately reaching a nadir of 5.13%. Nevertheless, in 2019, the growth rate experienced a notable recovery, reaching its peak value of 20.37%. Following this, the rate of growth became stable in the subsequent two years, gradually nearing the main threshold. By the year 2021, Qinzhou had effectively undergone a transformation from a cash cow market to a star market. In the last ten years, the fruit industry in Qinzhou has demonstrated a relatively consistent pattern of dynamic changes. Its market share has consistently remained above average, while the market growth rate has approached the primary threshold. Baise has consistently maintained a prominent status as a significant urban hub within the Guangxi region, specifically in relation to its involvement in the mango industry. Between the years 2012 and 2021, there was a sustained and uninterrupted increase in its market share on an annual basis. Since the year 2019, the product known as "Baize Mango" has been officially recognised and listed among China's esteemed compilation of the top 100 agricultural brand catalogue products. As previously stated, Baise experienced a substantial metamorphosis in the specified year, transitioning extensively from a child market to a star market.

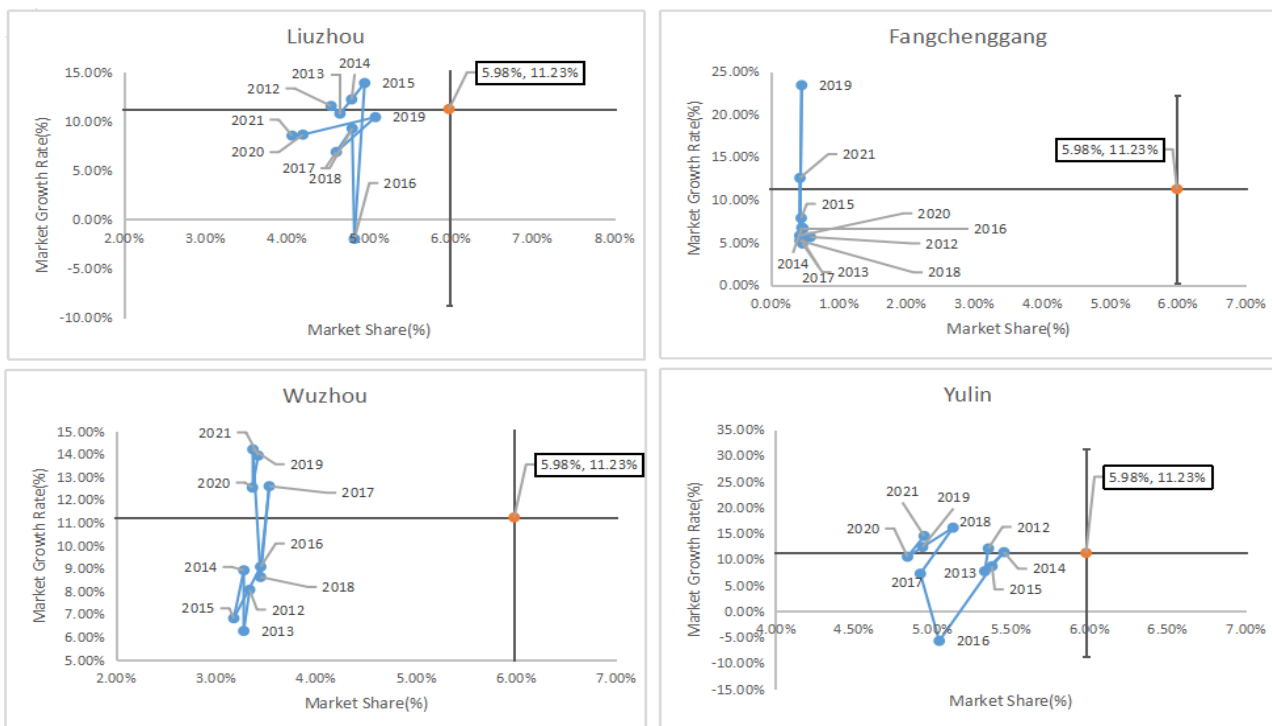


Figure 7. Market form changes in Liuzhou, Yulin, Fangchenggang, and Wuzhou

Wuzhou

During the past decade, the market trends in Liuzhou, Wuzhou, Beihai, Fangchenggang, Guigang, Yulin, Hechi, Laibin, and Chongzuo have demonstrated fluctuations and substantial transformations in the child market and dog market. The company's market share and growth rate exhibit performance levels that fall below the industry average. Nevertheless, the overall rate of growth exhibits an ascending trajectory, suggesting encouraging prospects for additional advancement. The fruit industry in Guangxi holds considerable importance and has consistently garnered government attention and strategic planning as a pivotal sector for development. The "Guangxi Implementation Plan for Promoting the High-Quality Development of the Fruit Industry" was issued by the government of Guangxi, China, in 2022. The present document delineates multiple production objectives, a construction strategy for noteworthy projects pertaining to high-calibre advancement, and a distribution chart that underscores pivotal support regions for prevailing fruit cultivars. The aforementioned initiatives are integral components of the overarching strategic framework referred to as "The 14th Five-Year Plan". Every urban centre possesses a unique scientific approach aimed at fostering and advancing its prevailing fruit sector.

As an example, it can be observed that Liuzhou is known for its cultivation of tangerines, Shatian pomelos, and

kumquats. Wuzhou places a high emphasis on the cultivation of Shatian pomelos and longan fruits. The cultivation of lychees is prominent in Beihai, whereas Fangchenggang specialises in the production of early-maturing tangerines and golden passion fruits. Guigang is recognised for its cultivation of longan and lychee fruits, while Yulin has gained a reputation for its banana and dwarf banana cultivars. Hechi is committed to the cultivation of sweet persimmons and kiwis, whereas Laibin focuses on the production of purple passion fruits. Finally, it should be noted that Chongzuo has gained recognition for its cultivation of grapes and dragon fruits. The establishment of advantageous production areas can facilitate the enhancement of specialised agricultural industrial parks across various cities, thereby promoting the production of distinctive agricultural products. This phenomenon will result in the progressive reduction of excess production capacity, consequently bolstering the competitiveness of the fruit industry in the Guangxi region. The visual representation presented depicts the importance of Nanning, Guilin, Qinzhou, and Baise as pivotal support markets for the fruit industry in the Guangxi region. To bolster the competitive edge of Guangxi's forthcoming fruit industry, it is advisable to investigate potential markets encompassing Liuzhou, Wuzhou, Beihai, Fangchenggang, Guigang, Yulin, Hechi, Laibin, Chongzuo, and Hezhou.

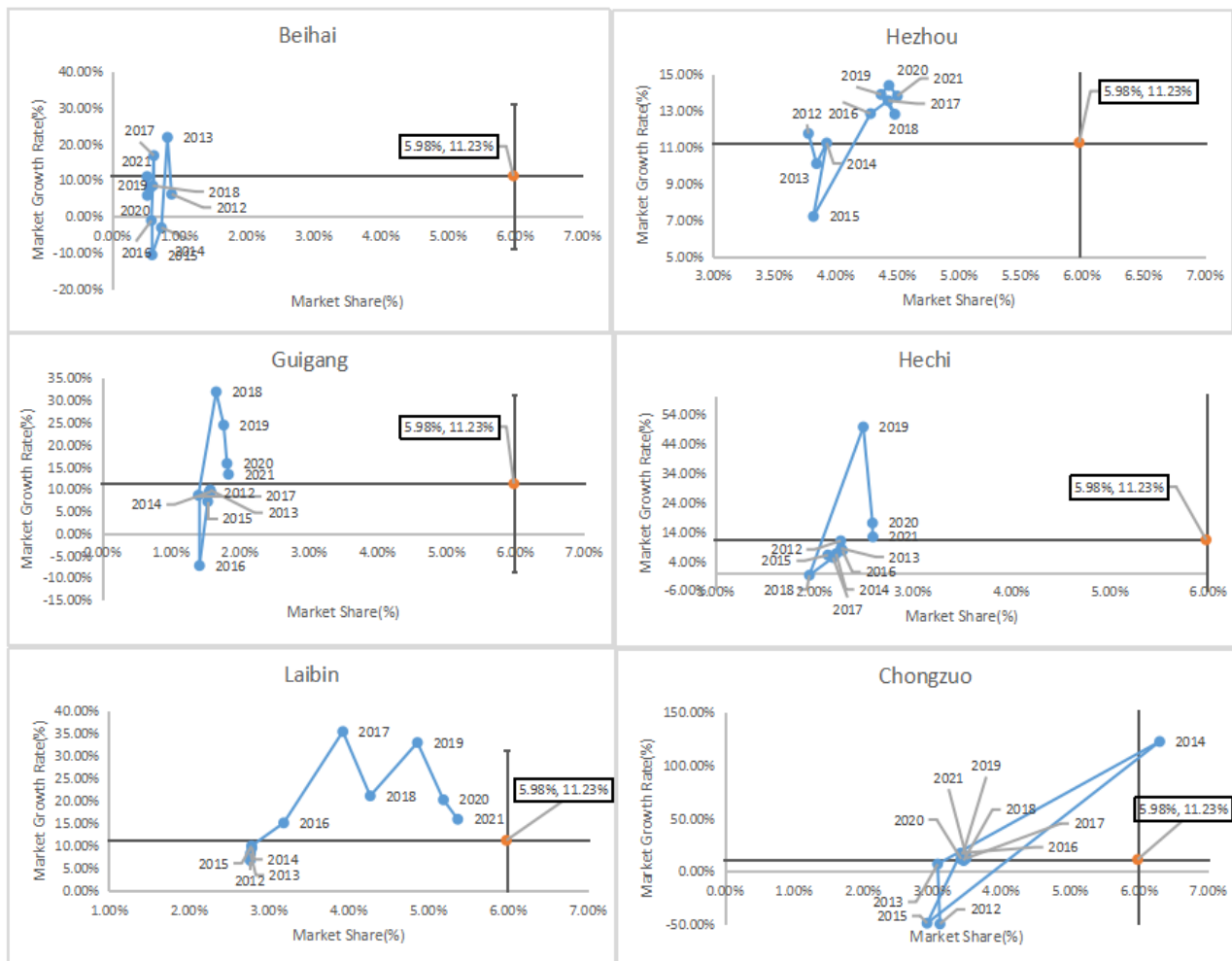


Figure 8. Market changes in Beihai, Hezhou, Guigang, Hechi, Laibin and Chongzuo

Conclusions

In conclusion, there is a substantial discrepancy present within the fruit industry across diverse urban areas, characterised by a pronounced uniformity in fruit availability. In particular, the province of Guangxi, encompassing a total of 14 cities, exhibits a limited participation in the Jinniu Market and Star Market, with only three cities, namely Nanning, Guilin, and Qinzhou, actively engaging in these markets. In contrast, it can be observed that the remaining 11 cities are situated within the child and dog market, thereby suggesting an unequal level of development within the fruit industry across these particular cities. The resolution of this matter requires government agencies to adopt a methodical approach under effective leadership. The proposed methodology should encompass the systematic design of the urban planting layout, the identification of appropriate zones for various fruit crops based on their genetic attributes, and the removal of obsolete cultivation areas and unsuitable regions. The avoidance of large-scale production of homogeneous fruits and the subsequent competition among fruit farmers can be achieved through the optimisation of planting structure and its alignment with market demand.

Moreover, it is imperative for urban areas to proactively cultivate and promote their advantageous fruit industries. Guangxi Fruit ought to give precedence to the optimisation of its orchard infrastructure in order to bolster its market competitiveness and endeavour towards the implementation of large-scale professional planting and management practices. Within the child market segment, there exist 11 cities, namely Liuzhou, Wuzhou, and Beihai, wherein the market share of the fruit industry falls below the average for the respective province. These eleven urban areas are home to a considerable quantity of orchards situated in topographically elevated and mountainous terrain. However, it is important to note that a significant number of orchards currently utilise antiquated planting techniques and suffer from inadequate hydropower infrastructure. Furthermore, the implementation of measures pertaining to land fertilisation and pest control is insufficient. As a result, the fruit trees cultivated in these orchards demonstrate limited resilience to external factors, leading to diminished productivity and compromised fruit quality.

Therefore, it is recommended to explore the option of partnering with financially stable third-party enterprises or government entities to provide assistance in funding the development of infrastructure and the acquisition of equipment for fruit farms. It is recommended to simultaneously utilise outstanding talent, consolidate technical resources, enhance research and development efforts in emerging technologies, and establish demonstration zones for the fruit industry. This approach will enable the automation and digitization of the complete value chain within the fruit industry. Furthermore, it is crucial to optimise the advancement of fruit brands and strengthen the marketing strategies implemented for fruit brands. The cultivation of a unique fruit brand culture can be achieved through the implementation of comprehensive research into the historical

and folk traditions linked to fruits, the creation of captivating narratives surrounding fruit brands, and the development of visually appealing packaging for fruit brand images.

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References

- Bakhshinejad, M., & Hassanzadeh, A. (2012). Comparative advantage of selected agriculture products in Iran: a revealed comparative advantage assessment. *Agricultura Tropica et Subtropica*, 45(1), 28-31. doi: <https://doi.org/10.2478/v10295-012-0004-9>
- Bohdaniuk, O., Buriak, R., & Savchuk, V. (2019). Competitiveness of horticultural products as a precondition of industry development. *Entrepreneurship and Sustainability Issues*, 6(4), 1587. doi: [http://doi.org/10.9770/jesi.2019.6.4\(3\)](http://doi.org/10.9770/jesi.2019.6.4(3))
- China Statistical Database. (2023, June 4). *China Rural Statistical Yearbook 1985-2022*. Retrieved from <https://www.shujuku.org/china-rural-statistical-yearbook.html>
- Gül, M. (2006). Technical efficiency of apple farming in Turkey: A case study covering Isparta, Karaman and Nigde provinces. *Pakistan Journal of Biological Sciences*, 9(4), 601-605. doi: <https://doi.org/10.3923/pjbs.2006.601.605>
- Hai'e, J. (2016). *Research on the competitiveness of the apple industry in Gansu Province*. Gansu Agricultural University.
- Han, Z., Niu, W., & Chang, X. (2021). Analysis of concentration and competitiveness of the apple industry cluster in Yuncheng, Shanxi. *China Fruit Science*, (03), 91-97. Retrieved from <https://www.fx361.com/page/2021/0413/21612879.shtml>
- Henderson, B. (1970, January 01). *The product portfolio*. Boston Consulting Group. Retrieved from <https://www.bcg.com/publications/1970/strategy-the-product-portfolio>
- Huang, C. (2006). *Research on the Competitiveness of Tourism Industry in Anhui Province*. Hefei: Anhui People's Publishing House.
- Jian, W. X., & Nong, Q. (2022, November 11). *Chongzuo Area of the China (Guangxi) Pilot Free Trade Zone: Turning ASEAN Fruit Channel Advantages into Industrial Advantages*. Guangxi Daily. Retrieved from http://gx.news.cn/2022-11/11/c_1129119377.htm
- Kun, Q., Yuenan, L., & Yingxue, L. (2021). Analysis of Dandong 99 strawberry market competitiveness Based on Porter's five forces model. *E3S Web of Conferences*, 253, 03058. doi: <https://doi.org/10.1051/e3sconf/202125303058>
- Lakner, S., Brenes-Muñoz, T., & Brummer, B. (2017).

- Technical efficiency in Chilean agribusiness industry: A metafrontier approach. *Agribusiness*, 33(3), 302-323. doi: <https://doi.org/10.1002/agr.21493>
- Lily, J. (2015). Analysis on the international competitiveness of Zhangzhou City's fruit and vegetable exports. *Journal of Mudanjiang Normal University: Social Sciences Edition*, (4), 52-55. Retrieved from <http://www.cqvip.com/qk/81348x/20154/665776347.html>
- Neves, M., Trombin, V., Marques, V., & Martinez, L. (2020). Global orange juice market: a 16-year summary and opportunities for creating value. *Tropical Plant Pathology*, 45, 166-174. doi: <https://doi.org/10.1007/s40858-020-00378-1>
- Notice of the General Office of the People's Government of Guangxi Zhuang Autonomous Region on Issuing the Implementation Plan for Promoting the High-Quality Development of the Fruit Industry in Guangxi (issued by Guizheng Administration [2022] No. 41). Communiqué of the People's Government of Guangxi Zhuang Autonomous Region, 2022(21), 4-21.
- Porter, M. E. (1985). *Competitive strategy: Creating and sustaining superior performance*. New York: Free Press.
- Qian, K. (2022). Guangxi: The entire fruit industry chain in Nanning brings 300,000 farmers. *Information on China's fruit industry*, 39(10), 52-53.
- Reginato, G. H., Carrasco, Ó., & García de Cortázar, V. (2008). Evolution of Planting and Training Systems in Apple and Peach Orchards Over 25 Years of Intensive Fruit Industry Development in Chile. In *XXVII International Horticultural Congress - IHC2006: International Symposium on Enhancing Economic and Environmental Sustainability of Fruit Production in a Global Economy* (pp. 431-440). International Society for Horticultural Science (ISHS), Leuven, Belgium. doi: <https://doi.org/10.17660/ActaHortic.2008.772.74>
- Sokolov, O. V., Castornov, N. P., & Zhilyakov, D. I. (2021). Current state and problems of development of organic gardening in Russia. *IOP Conference Series: Earth and Environmental Science*, 845(1), 012048. doi: <https://dx.doi.org/10.1088/1755-1315/845/1/012048>
- Urdushev, K., Eshankulov, S., & Mavlyanov, M. (2021). About the state and development of fruit and vegetable clusters in Uzbekistan. *Asian Journal of Multidimensional Research (AJMR)*, 10(3), 455-463. doi: <http://dx.doi.org/10.5958/2278-4853.2021.00157.9>
- Wang, D., & Cui, M. (2020). Analysis of concentration and competitiveness of the fruit industry cluster in Shandong Province: A case study of Yantai apple, Laiyang pear, and Dazeshan grapes. *Forestry Economics*, 42(02), 83-92. doi: <https://doi.org/10.13843/j.cnki.lyji.20200415.002>
- Wang, Y. R. (2022). Research on the Evaluation and Enhancement of the Competitiveness of Guangxi Fruit Industry. *Guangxi University*, 002141.
- Xinhua News Agency. (2022, March 12). *The 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Outline of Long-Range Goals for 2035*. Central People's Government of China. Retrieved from https://www.gov.cn/xinwen/2021-03/13/content_5592681.htm
- Zeng, H., Song, Z., Zhao, H., Xiang, B., & Xu, S. (2021). Analysis of scale quality and competitive advantage of Yantai fruit industry cluster. *China Fruit Science*, 5, 100-105. Retrieved from <https://m.fx361.com/news/2021/0524/21596546.html>
- Zhang, Y., Tan, X., & Deng, M. (2017). Guangxi fruit industry competitiveness analysis. *Northern Horticulture*, (6), 181-185. Retrieved from <http://www.cqvip.com/qk/97019x/201706/671661058.html>
- Zhang, Y. L. (2022). Research on production efficiency of Guangxi fruit industry under rural revitalization strategy. *Agricultural Research and Application*, 35(01), 59-66.
- Zheng, X., & Zhuang, L. (2015). Analysis on changes in comparative advantage and competitiveness of China's tropical fruits. *World Agriculture*, 6, 127-131.