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Optimization Strategies for the Planting Industry Structure in Guizhou Province Based on Comparative Advantages

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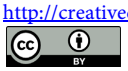

Abstract

Utilizing the theory of comparative advantage, this study analyzes the comparative advantages of major crops in Guizhou Province from 2018 to 2022 through the efficiency advantage index, scale efficiency index, and comprehensive advantage index. The findings indicate that, compared to the national average, rice, potatoes, rapeseed, sesame, flue-cured tobacco, and chili exhibit efficiency advantages within Guizhou Province. Additionally, the cultivation of sorghum, tubers (potatoes), rapeseed, tobacco leaves, vegetables (peppers), tea, and fruits demonstrates significant scale advantages. Overall, crops such as sorghum, potatoes, rapeseed, flue-cured tobacco, vegetables (peppers), and tea possess strong comprehensive advantages. Based on the analysis of competitiveness and actual development, this study offers recommendations for enhancing the efficient development of the planting industry in Guizhou Province, focusing on aspects such as the structure of the planting industry, the spatial arrangement of crops, the industrialization of agricultural operations, and government services.

Keywords

Comparative Advantage Scale Advantage, Comprehensive Advantages, Planting Industry Agricultural Products

1. Introduction

With the acceleration of marketization and internationalization in agriculture, Guizhou Province, located in southwest China, faces significant structural challenges in the development of its planting industry. Notably, approximately 70% of

the province's total area consists of karst landforms, characterized by plateaus, mountains, hills, and basins. Consequently, issues such as limited land resources and poor land quality are prevalent. Despite these challenges, as of 2022, the total agricultural output value of Guizhou Province represented over 16.43% of the province's total output value. The annual output value of the planting industry has consistently comprised more than 56% of the total output value of agriculture, forestry, animal husbandry, and fishery in the province over the past decade, reaching 67.51% in 2022. Furthermore, the total sown area of major crops constitutes 3.2% of the national total. Therefore, the adjustment of the planting industry structure in Guizhou not only enhances agricultural production across various regions of the province but also holds significant importance from a national perspective.

In recent years, research on agricultural comparative advantages, regional agricultural planning, and rural development policies in China has advanced significantly, offering substantial theoretical support and practical references for this study. Zhou et al. (2020) examined tea crops in Guizhou Province using the comprehensive comparative advantage index method. Their findings indicated that the alignment between the comparative advantages of characteristic crops and regional resource endowments directly influences industrial competitiveness. Furthermore, the research conducted by scholars such as Deng et al. (2014) further verified the applicability of this method in the karst landform areas of southwestern China. Song et al. (2024) investigated the competitive advantages and developmental potential of Xinjiang's peanut industry using three advantage indices. They emphasized that the dynamic balance between efficiency advantage and scale advantage is crucial for enhancing the competitiveness of the regional planting industry. Furthermore, they highlighted the need for the region to address the coordination of scale expansion and efficiency improvement for characteristic crops. In a related study, Tian & Feng (2018) examined the advantages of tea cultivation in Guizhou Province and concluded that leveraging local ecological advantages to develop tea characteristic industries can effectively alleviate land resource constraints in karst areas. Yu (2012)'s findings provide a practical foundation for the regional differentiated layout proposed in this study. Additionally, researchers such as Jiang et al. (2024) and Fan et al (2023) have conducted comparative studies on individual crops, while others have analyzed the comparative advantages of multiple crops. For example, Li et al. (2024), Chen & Liu (2022), Sun et al. (2010) and Wang et al. (2010) utilized years of crop planting data to examine the spatio-temporal distribution advantages of major crops across various regions. They noted that policies play a significant role in guiding the large-scale cultivation and industrial processing of advantageous crops, particularly subsidy policies for characteristic economic crops, which directly influence farmers' planting decisions.

Given the limited research on the advantages of the planting industry in Guizhou Province, which has focused primarily on a single crop, this paper builds upon the methodologies of previous scholars. Utilizing the theory of comparative advantage, it analyzes relevant statistical data from 2018 to 2022, focusing on the

main crops currently cultivated in Guizhou Province. The study measures and analyzes comparative advantages to identify crops with comprehensive comparative advantages, which are proposed as the optimal planting varieties for the region. Based on these findings, the paper offers recommendations aimed at facilitating the adjustment of the planting structure within the province.

2. Methods and Data Sources

This research employs the comprehensive comparative advantage index method to assess the comparative advantages of the planting industry in Guizhou Province. The calculated indicators encompass the efficiency advantage index, the scale advantage index, and the comprehensive advantage index. According to Li et al. (2005), the comprehensive comparative advantage index serves to evaluate and compare the advantages of a specific product across various regions or among different products within the same region. The calculation method is as follows:

2.1. Efficiency Advantage Index (EAI)

This study utilizes the Efficiency Advantage Index (EAI) to assess the relative production efficiency of a specific region in cultivating its primary crop, which, in this case, is the main crop of Guizhou Province. The EAI is determined by analyzing the unit area yield of this crop in the region relative to the average unit area yield of all crops within the region and the national average of this ratio. The calculation formula is as follows:

$$EAI_{mn} = \frac{AP_{mn}/AP_{n}}{AP_{n}/AP} \quad (1)$$

According to Formula (1), EAI_{mn} denotes the efficiency advantage index of crop n in Area m. AP_{mn} indicates the yield per unit area of crop n in Area m. AP_{m} represents the average yield per unit area of all crops in Area m. AP_{n} reflects the average yield per unit area of crop n across the country. Finally, AP signifies the average yield per unit area of all crops nationwide.

If $EAI_{mn} > 1$, this indicates that the production of n crops in Area m demonstrates an efficiency advantage compared to the national level. Conversely, if $EAI_{mn} < 1$, it suggests that the production efficiency of n crops in Area m is below the national average. A higher EAI_{mn} value reflects a more significant advantage in production efficiency.

2.2. Scale Advantage Index (SAI)

The Scale Advantage Index (SAI) quantifies both the production scale and the degree of specialization of a specific crop, specifically the primary crop in Guizhou Province, within a defined region. This index evaluates the comparative relationship between the ratio of the sown area of the crop in the region and the total sown area of all crops in that region, in relation to the national average of this ratio. The objective of this analysis is to assess the relative scale advantage of the crop's production within the region. The calculation formula is as follows:

$$SAI_{mn} = \frac{GS_{mn}/GS_m}{GS_n/GS} \quad (2)$$

In Formula (2), SAI_{mn} denotes the scale advantage index for n crops in Area m, while GS_{mn} indicates the sown area of n types of crops in Area m. Additionally, GS_m represents the total sown area of all crops in Zone i. GS_n refers to the sown area of n types of crops nationwide, and GS signifies the total sown area of all crops in the country.

If $SAI_{mn} > 1$, this indicates that the production of crop j in Area i exhibits a scale advantage relative to the national level. Conversely, if $SAI_{mn} < 1$, it signifies that the production of n crops in Area m is disadvantaged compared to the national level. A smaller SAI_{mn} value reflects a more pronounced disadvantage.

2.3. Comprehensive Advantage Index (AAI)

The comprehensive advantage index integrates the results of the efficiency advantage index and the scale advantage index, providing a more thorough assessment of the production strengths or weaknesses of a specific crop in a designated area. Its value is determined by the square root of the product of the efficiency advantage index and the scale advantage index. The calculation formula is as follows:

$$AAI_{mn} = \sqrt{EAI_{mn} \times SAI_{mn}} \quad (3)$$

When $AAI_{mn} > 1$, it signifies that the production of n crops in Area m possesses a comparative advantage relative to the national average. Conversely, when $AAI_{mn} < 1$, it indicates that the production of n crops in Area m is at a disadvantage compared to the national level. A larger AAI_{mn} ratio reflects a more pronounced advantage.

2.4. Data Sources

To ensure the objectivity and comprehensiveness of the comparative advantage calculations, this study focuses on the primary crops within Guizhou Province's agricultural sector. It analyzes data spanning five years (2018-2022) to minimize calculation errors and enhance the authenticity and reliability of the findings. The regional and national statistics regarding the sown area of crops, total regional agricultural output, and total national agricultural output, which are utilized in calculating the efficiency advantage index, scale advantage index, and comprehensive advantage index, are sourced from the "China Statistical Yearbook" (2019-2022), the "Guizhou Statistical Yearbook" (2019-2022), and the annual statistical bulletins of Guizhou Province. The term "all crops", as employed in this article, does not include every crop listed in the statistical yearbook; rather, it specifically pertains to the crops utilized in this research. These crops encompass grains, cereals, rice, wheat, corn, sorghum, legumes, soybeans, tubers, potatoes, cotton, oilseeds, peanuts, rapeseed, sesame seeds, flax, sugar crops, sugarcane, tobacco leaves, flue-cured tobacco, vegetables, peppers, tea, and fruits. Certain crops, such as flax, are

categorized for convenience in calculations. This classification reveals that most crops have distinct subsets, which facilitate the examination of the planting advantages associated with specific categories, including grains and tubers.

3. Results and Analysis

3.1. Results of Efficiency Comparative Advantage Calculation

In Guizhou Province's agricultural sector, the comparative advantage in the efficiency of grain crops is not pronounced. Only rice and potatoes exhibit an advantage index greater than 1, while all other grain crops fall below this threshold. Among oilseeds, rapeseed and sesame demonstrate a relatively high efficiency advantage. Additionally, flue-cured tobacco and chili peppers also show significant efficiency advantages. Conversely, the efficiency advantage indices for wheat, soybeans, cotton, tea, and fruits are comparatively low, placing them at a disadvantage relative to the national average (see Table 1).

Table 1. Comparative advantage index of efficiency of major agricultural products in Guizhou Province's planting industry.

Year	2018	2019	2020	2021	2022	Mean
Grain	0.95	0.92	0.85	0.80	0.79	0.86
Cereal	1.10	1.08	1.00	0.95	0.92	1.01
Rice	1.23	1.23	1.13	1.07	1.05	1.14
Wheat	0.60	0.58	0.54	0.50	0.50	0.54
Corn	0.97	0.94	0.89	0.88	0.86	0.91
Sorghum	0.84	0.83	0.83	0.85	1.05	0.88
Beans	0.66	0.65	0.65	0.63	0.72	0.66
Soybean	0.72	0.68	0.68	0.66	0.68	0.68
Tubers	1.12	1.08	0.99	0.91	0.90	1.00
Potato	1.21	1.16	1.08	0.96	0.93	1.07
Cotton	0.75	0.72	0.69	0.58	0.54	0.66
Oil plants	0.89	0.87	0.83	0.81	0.79	0.84
Peanut	0.81	0.83	0.83	0.79	0.73	0.80
Rapeseed	1.18	1.15	1.08	1.02	1.01	1.09
Sesame	1.12	1.20	1.19	0.98	0.95	1.09
Bast fiber crops	0.57	1.23	1.17	0.40	0.29	0.73
Sugar crops	1.09	1.07	0.98	0.89	0.84	0.97
Sugarcane	1.06	1.03	0.96	0.86	0.81	0.94
Tobacco leaf	1.12	1.10	1.02	0.96	0.94	1.03
Tobacco	1.11	1.09	1.02	0.96	0.95	1.02
Vegetables	0.75	0.75	0.72	0.73	0.74	0.74
Chili pepper	1.03	1.14	1.05	1.01	0.98	1.04
Tea leaf	0.61	0.65	0.62	0.64	0.66	0.64
Fruit	0.41	0.39	0.39	0.41	0.43	0.41

The data in the table is calculated based on the relevant data from the National Bureau of Statistics, the Guizhou Provincial Bureau of Statistics and the government's official website.

3.2. Calculation Results of Scale Comparative Advantage

From the perspective of the scale advantage index, several major agricultural crops in Guizhou Province exhibit significant scale advantages, including sorghum, tubers (potatoes), rapeseed, tobacco leaves, vegetables (peppers), tea, and fruits. Notably, vegetable peppers demonstrate a pronounced scale advantage, with a scale comparative advantage index of 13.4. In contrast, the scale comparative advantage indices for other crops, such as rice, wheat, corn, soybeans, cotton, peanuts, sesame, flax, and sugarcane, are all below 1, indicating a lack of scale advantages. Specifically, wheat, cotton, sesame, and flax have scale advantage indices of less than 0.2, reflecting a substantial disadvantage in their scale advantages (see Table 2).

Table 2. Scale advantage index of major agricultural products in Guizhou Province's planting industry.

Year	2018	2019	2020	2021	2022	Mean
Grain	0.71	0.71	0.72	0.74	0.75	0.72
Cereal	0.46	0.45	0.45	0.46	0.48	0.46
Rice	0.67	0.68	0.68	0.67	0.66	0.67
Wheat	0.18	0.18	0.18	0.18	0.15	0.17
Corn	0.43	0.39	0.37	0.40	0.46	0.41
Sorghum	3.01	3.44	4.03	4.41	7.35	4.45
Beans	0.97	0.87	0.89	1.05	0.98	0.95
Soybean	0.72	0.62	0.66	0.78	0.72	0.70
Tubers	3.81	4.02	4.19	4.03	4.01	4.01
Potato	4.65	5.07	5.43	5.12	5.17	5.09
Cotton	0.01	0.00	0.00	0.00	0.00	0.00
Oil plants	1.53	1.40	1.35	1.19	1.33	1.36
Peanut	0.34	0.33	0.31	0.30	0.27	0.31
Rapeseed	2.30	2.05	1.95	1.99	2.21	2.10
Sesame	0.04	0.04	0.05	0.05	0.03	0.04
Bast fiber crops	0.15	0.11	0.12	0.09	0.05	0.11
Sugar crops	0.20	0.20	0.20	0.19	0.16	0.19
Sugarcane	0.23	0.23	0.23	0.21	0.18	0.22
Tobacco leaf	4.17	4.10	4.02	4.20	4.01	4.10
Tobacco	4.06	4.05	4.01	4.18	4.00	4.06
Vegetables	2.08	2.08	2.15	2.14	2.06	2.10
Chili pepper	12.8	12.9	13.6	14.3	13.6	13.4
Tea leaf	4.73	4.53	4.53	4.44	4.40	4.52
Fruit	1.48	1.69	1.89	1.95	1.88	1.78

The data presented in the table is derived from relevant sources, including the National Bureau of Statistics, the Guizhou Provincial Bureau of Statistics, and the official government website. Notably, the cotton scale advantage index is less than 0.01; therefore, it is represented as 0.00.

3.3. Results of Comprehensive Comparative Advantage Calculation

Guizhou Province combines the benefits of efficiency and scale, resulting in a significant comprehensive advantage in cultivating various crops, including sorghum, potatoes, rapeseed, flue-cured tobacco, vegetables (particularly peppers), and tea. Notably, the crop with the highest comprehensive advantage index is the chili pepper, which has an index of 3.75, followed by potatoes, which possess a comprehensive advantage index of 2.33 (see Table 3).

Table 3. Comprehensive advantage index of major agricultural products in Guizhou Province's planting industry.

Year	2018	2019	2020	2021	2022	Mean
Grain	0.82	0.81	0.78	0.77	0.77	0.79
Cereal	0.71	0.69	0.67	0.66	0.67	0.68
Rice	0.91	0.91	0.87	0.85	0.83	0.88
Wheat	0.33	0.32	0.31	0.30	0.28	0.31
Corn	0.65	0.61	0.57	0.59	0.63	0.61
Sorghum	1.59	1.69	1.83	1.93	2.77	1.96
Beans	0.80	0.75	0.76	0.81	0.84	0.79
Soybean	0.72	0.65	0.67	0.72	0.70	0.69
Tubers	2.06	2.08	2.04	1.91	1.90	2.00
Potato	2.37	2.43	2.42	2.22	2.20	2.33
Cotton	0.07	0.05	0.05	0.05	0.05	0.05
Oil plants	1.17	1.10	1.06	0.98	1.03	1.07
Peanut	0.53	0.52	0.50	0.49	0.44	0.50
Rapeseed	1.65	1.54	1.45	1.42	1.49	1.51
Sesame	0.22	0.22	0.24	0.21	0.17	0.21
Bast fiber crops	0.29	0.38	0.38	0.19	0.13	0.27
Sugar crops	0.47	0.46	0.45	0.41	0.37	0.43
Sugarcane	0.49	0.49	0.47	0.43	0.38	0.45
Tobacco leaf	2.17	2.12	2.03	2.00	1.94	2.05
Tobacco	2.13	2.10	2.02	2.00	1.95	2.04
Vegetables	1.25	1.25	1.25	1.25	1.24	1.25
Chili pepper	3.64	3.84	3.79	3.80	3.66	3.75
Tea leaf	1.70	1.71	1.67	1.69	1.71	1.70
Fruit	0.78	0.81	0.86	0.90	0.90	0.85

The data presented in the table is derived from the relevant annual statistics provided by the National Bureau of Statistics, the Guizhou Provincial Bureau of Statistics, and the official government website.

4. Suggestions

4.1. Optimizing the Agricultural Planting Structure and Increasing the Proportion of Advantageous Crops Planted

Based on the analysis of comparative advantages, Guizhou Province should implement targeted measures to adjust its planting structure, specifically by optimizing the proportion of agricultural products that demonstrate significant comparative advantages. Initially, practical measures must be adopted to support crops with strong comprehensive comparative advantages. The cultivation areas for crops such as sorghum, potatoes, rapeseed, flue-cured tobacco, tea, and vegetable peppers should be expanded. In the low-temperature river valleys and hilly basins of northern and northeastern Guizhou, including Zunyi City (around Xiazi Town) and Qiandongnan Prefecture, the favorable water and heat conditions, along with a flexible farming system, present an opportunity for the vigorous development of large-scale pepper cultivation. Concurrently, winter-fallow fields should be utilized to enhance rapeseed production, thereby establishing an efficient planting model based on a "pepper-rapeseed" rotation. For crops such as rice and sesame, which possess relatively high comparative advantages in efficiency, it is essential to intensify scientific research and variety improvement to further capitalize on these advantages. For crops like rice and sesame, which exhibit relatively high efficiency comparative advantages, it is essential to enhance scientific research and variety improvement to further capitalize on these advantages. Additionally, for crops with substantial comparative advantages in scale, such as sorghum, tea, and fruits, their cultivation areas should be gradually increased, thereby elevating their share within the overall agricultural sector. Conversely, for crops like cotton and wheat, which are relatively disadvantaged in production and possess low development potential, a series of restrictive measures should be implemented to gradually decrease their representation in the planting industry.

4.2. Adapting Measures to Local Conditions and Optimizing the Spatial Layout of Advantageous Crops

Adapt measures to local conditions and optimize the spatial layout of advantageous crops. The spatial configuration and integration of agricultural development are critically dependent on natural resources, which significantly influence the production and advancement of regional crops. Guizhou Province must thoroughly address challenges such as topography, climate, labor characteristics, and the lag in agricultural productivity across various regions, necessitating adjustments to the local agricultural layout. In areas characterized by high elevation, extensive arable land, and low population density, it is essential to actively encourage farmers to cultivate potatoes and flue-cured tobacco, thereby establishing specialized planting bases for these crops. In the northwest region of Guizhou Province, including Bijie City and Liupanshui City, the relatively high altitude and cool climate contribute to an abundance of cultivated land resources, despite a low

population density. Consequently, it is essential to prioritize the development of high-quality vegetable and processing potato industrial belts. Simultaneously, efforts should be directed toward consolidating and enhancing the scale and quality of flue-cured tobacco cultivation in traditional tobacco-growing areas, such as the northern part of Zunyi City and the eastern part of Tongren City, to establish specialized production bases for potatoes and flue-cured tobacco in the plateau mountainous regions. Conversely, for crops like corn and wheat, which face limitations in land, water, and technology, as well as lacking scale advantages, it is advisable to reduce their cultivation areas or promote them only in regions conducive to their growth. This approach will ensure that resources are utilized more effectively for the cultivation of agricultural products that possess stronger comparative advantages. In the tea-growing regions of northern and eastern Guizhou, including Zunyi City (Meitan, Fenggang), Qiannan Prefecture (Duyun), and Tongren City (Shiqian), the undulating mountains, often shrouded in mist, and predominantly acidic soils create an ideal environment for the cultivation of ecological green tea and selenium-rich tea. It is essential to optimize the layout of tea gardens, phase out low-yield and outdated varieties, and prioritize the development of high-value-added, renowned, and high-quality teas, as well as organic options, to establish a world-class golden industrial belt for tea. In the low-temperature river valley regions of the Nanpan River and Hongshui River basins, such as Zhenfeng and Wangmo in Qiannan Prefecture and Luodian in Qiannan Prefecture, the "natural greenhouse" effect should be fully harnessed to focus on the cultivation of early-maturing vegetables and high-quality tropical fruits, including pitaya, passion fruit, and mango. Concurrently, in central Guizhou areas such as Xiwen and Qishe, it is important to consolidate and expand the cultivation advantages of distinctive fruits like kiwifruit and blueberries.

4.3. Promoting the Industrialization of Agricultural Production and Facilitating the Formation of Leading Enterprises with High Competitiveness

Currently, most rural areas in Guizhou Province continue to rely on the traditional small-scale family-run agricultural production model, with agricultural product processing primarily limited to rudimentary methods. The relatively low number of agricultural cooperative organizations, comprehensive service entities, and agricultural enterprises hampers the ability of this decentralized production and operation model to enhance agricultural competitiveness. To mitigate this challenge, regional governments in Guizhou Province should actively promote the industrialization of crops with significant comparative advantages, such as potatoes and rapeseed, to facilitate the establishment of competitive leading enterprises. By capitalizing on the rapid market responsiveness, robust market expansion capabilities, and high degree of systematization of these leading enterprises, effective organization of farmers can be achieved. The development of agricultural processing enterprises focusing on potatoes, rapeseed, and peppers will further

promote the industrialization of local production, enhance the processing levels, and increase the added value of agricultural products, ultimately contributing to the growth of farmers' incomes.

4.4. Strengthening the Government's Services for Agriculture and Creating a Favorable Development Environment for the Planting Industry

Agriculture, often regarded as a disadvantaged industry, necessitates active government promotion and protection to develop its comparative advantages. In this context, the government should enhance public services, including institutional arrangements, the collection and dissemination of market information, improvements to agricultural market infrastructure, and the research and promotion of agricultural science and technology. These efforts are essential to provide robust support for agricultural production and to foster a conducive environment for agricultural development. While maintaining the market's decisive role in resource allocation, the government should encourage farmers to expand the cultivation of crops that exhibit stronger comparative advantages. Additionally, it is imperative to continue the development and enhancement of farmland water conservancy facilities to address issues related to agricultural irrigation and drainage. The introduction of flue-cured tobacco drying technology and associated machinery should be expanded to improve production efficiency in this sector. Furthermore, the establishment of agricultural machinery service stations in flue-cured tobacco planting regions is crucial for elevating local agricultural productivity. Finally, strengthening transportation infrastructure for agricultural production is necessary to mitigate challenges related to inconvenient transportation and high transport costs faced by crop producers in certain areas.

5. Discussion

This study utilizes the theory of comparative advantage to examine the planting structure in Guizhou Province, aligning with the foundational principles of regional agricultural specialization articulated by Ricardo (1817) and subsequently corroborated by contemporary agricultural economists (Pan et al., 2025; Chen & Liu, 2011). Research indicates that crops such as potatoes, tea, and peppers exhibit substantial comprehensive advantages. This finding suggests that geographical constraints, including karst landforms and climatic conditions, can significantly influence the competitive advantages of regional crops. In contrast to studies conducted in flat regions like the North China Plain, the Guizhou case underscores a distinctive "efficiency-scale balance" characteristic of mountain agriculture. While wheat and corn in flat areas depend on large-scale mechanization to realize economies of scale, the advantageous crops in Guizhou, such as potatoes and tea, compensate for the limitations of scale by adapting to sloping land conditions and fully leveraging ecological benefits. Weining County serves as a pertinent example. In this region, 82% of the sloping land is dedicated

to potato cultivation, with the starch content of these potatoes reaching 18.5%, which is 3 percentage points above the provincial average. This practice demonstrates that aligning crop characteristics with the conditions of marginal land can convert geographical limitations into competitive advantages. This model holds significant reference value for other karst regions globally, including Yunnan Province in China and certain areas in Southeast Asia, where sloping land constitutes over 60% of agricultural land. Furthermore, it offers a practical approach to addressing the conflict between land scarcity and the need to enhance agricultural efficiency in karst areas.

This study has three limitations that suggest avenues for future research. First, the calculation of the comprehensive advantage index does not incorporate economic factors such as market prices and production costs, potentially underestimating the influence of market fluctuations on crop competitiveness. Future research could develop a "dynamic comprehensive advantage index model" that integrates time series data on prices and costs, allowing for the quantification of the weight of economic factors in advantage evaluation through panel regression. Second, the provincial-level analysis obscures the variations in micro-conditions within the region, including factors such as soil pH and irrigation conditions. For example, Duyun City, which has a comprehensive tea advantage index of 1.88, benefits from acidic yellow soil (pH value 4.5 - 5.5) for producing high-quality tea; however, neighboring counties with neutral soil (pH value 6.0 - 7.0) struggle to achieve the same quality. Subsequently, "spatial econometric methods", such as crop suitability mapping utilizing GIS, can be employed to overlay biophysical and socio-economic data. This approach aims to refine regional layouts and improve the accuracy of policy recommendations. Thirdly, the research emphasizes advantages at the production stage while excluding the post-harvest value chain, which encompasses processing and brand development. Future investigations could explore a "collaborative mechanism between production advantages and value chain upgrading", assessing the impact of processing components, such as chili sauce and freeze-dried chili, on enhancing the overall competitiveness of crops through cost-benefit analysis.

6. Conclusion

In comparison to the national context, several major crops in Guizhou Province, including rice, potatoes, rapeseed, sesame, flue-cured tobacco, and peppers, exhibit efficiency advantages. The cultivation of sorghum, tubers (potatoes), rapeseed, tobacco leaves, vegetables (peppers), tea, and fruits demonstrates significant scale advantages. Overall, crops such as sorghum, potatoes, rapeseed, flue-cured tobacco, vegetables (peppers), and tea possess strong comprehensive advantages. This study suggests that, for the optimization of the planting structure in Guizhou Province, priority should be given to the development of crops (potatoes, tea, peppers) that are well-suited to the region's karst endowments.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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