



# Study on Concentration of Regional Agricultural Industry in China

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**Abstract.** Industrial concentration can measure the level of competition and monopoly in an industry. Based on data from the statistical yearbooks of a western province from 2013 to 2023 and data from leading enterprises in various characteristic industries of the province, combined with the Herfindahl-Hirschman Index (HHI), concentration calculations reveal that the primary sector is oligopolistic. The cotton and tomato industries operate under perfect competition, while the sugar industry is characterized by high oligopoly. The government should provide policy recommendations for the high-quality development of the agricultural industry.

**Keywords:** Concentration; Herfindahl-Hirschman Index; Agricultural Industry; A Western Province.

## 1 Introduction

Implementing the rural revitalization strategy contributes to the construction and development of our country's modern economic system, with the agricultural industry being a key force in addressing the issues related to agriculture, rural areas, and achieving the goal of rural revitalization. Mergers between enterprises not only optimize the competitive landscape, facilitate breakthroughs between industries, and promote mutual integration and infiltration, but also enhance inter-company competition, thereby reducing monopolistic control over resources. Industrial concentration is the most critical factor influencing market structure, reflecting the competitive dynamics and monopoly levels within the market. This paper will analyze the concentration of industries, examine the market monopoly situation of a leading agricultural enterprise in a western province, understand the agricultural industry structure in that province, and propose reasonable suggestions for agricultural development in that province.

## 2 Literature Review

### 2.1 Industrial Concentration

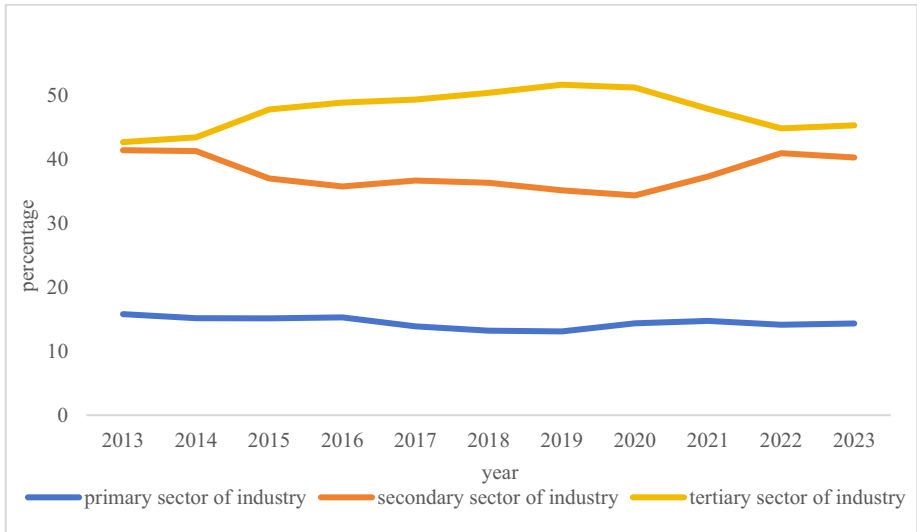
Industrial concentration measures the distribution of enterprise scale in a specific product or service market. With the continuous deepening and advancement of China's economic system reform, academic research on industrial concentration at home and abroad has gradually increased, becoming a highly focused area in the academic community. Aylward[1] conducted cluster analysis on innovation among small and medium enterprises in the Australian wine industry, evaluating core innovation activities of SMEs at different cluster development stages. Empirical studies have shown that innovation activities and levels gradually strengthen with the growth of industrial clusters. Bjørnar Sæther[2], from the perspectives of industrial areas and clusters, deeply explores the origin and current status of agricultural industry clusters in Norway, emphasizing the central role of industrial clusters. Vladimir[3] points out that under the backdrop of economic transformation, the development of agricultural industry clusters urgently requires innovative clusters. Following an in-depth study on the agricultural sugarcane cluster in Mexico, Gallego[4] promotes sustainable development of clusters characterized by fragmented society, power, and networks, with social innovation as a primary method. Liu Xiaojun et al. [5] found that by promoting the merger and reorganization of enterprises, not only can the scale of enterprises be increased, but also the concentration of the entire industry can be enhanced. This promotes progress in research and technological innovation within enterprises and better resolves overcapacity issues.

### 2.2 Literature Review Commentary

In conclusion, the academic community has conducted in-depth discussions on the industrial concentration of numerous sectors. However, there has been relatively inadequate attention paid to the concentration of the agricultural industry in a western province of China. Therefore, this article calculates and analyzes the concentration of the agricultural industry in this western province, aiming to provide a theoretical basis for promoting its development towards high quality.

## 3 Current Status of Regional Agricultural Industry Development

From 2013 to 2023, there were significant changes in the industrial structure of a western province. The proportion of value added in the three industries changed from 15.8:41.5:42.7 in 2013 to 14.3:40.3:45.3 in 2023. During this period, the proportion of the primary industry showed a steady decline, the proportion of the secondary industry fluctuated downward, and the proportion of value added in the tertiary industry exhibited a fluctuating upward trend. As shown in Figure 1:



**Fig. 1.** Changes in Industrial Structure in a Western Province

Note: Calculated based on annual statistical data from the Statistical Bureau of a western province.

As of March 1, 2022, there were 1,353 large-scale agricultural product processing enterprises in a western province, accounting for 18.2% of the total operating income of large-scale industrial enterprises; the average annual number of employees was 2,416.2 thousand, representing 15.4% of the total profits of all large-scale industrial enterprises; the total tax amount (taxes and surcharges) accounted for 9.5% of the total tax revenue of large-scale industrial enterprises. The large-scale agricultural product processing industry has been operating steadily.

As of September 2023, in a western province, there are 1,617 leading agricultural industrialization enterprises at the national, autonomous region, prefecture-level, and county-city level. Among them, 2 enterprises have annual operating incomes exceeding 10 billion yuan. However, there are relatively few deep processing enterprises associated with specialty agricultural products such as cotton, tomatoes, and peppers. The industry cluster lacks sufficient development capability, unable to effectively drive the economic growth of a province in western China.

## 4 Analysis of Agricultural Industry Concentration in a Western Province

### 4.1 Herfindahl-Hirschman Index

The Herfindahl-Hirschman Index, often utilized by researchers and governmental institutions to assess industrial concentration, quantifies market share by calculating the squared sum of each competitor's revenue or assets within an industry relative to the

industry's total.  $X$  represents the overall market size, while  $X_i$  denotes the size of the  $i$ -th industry. The formula for calculation is:

$$HHI = \sum_{i=1}^n \left( \frac{X_i}{X} \right)^2 \tag{1}$$

Calculations were made for six indicators of agricultural, forestry, animal husbandry, fishery, and service industry output in the statistical bureau of a western province from 2013 to 2022. By organizing statistical data, Table 1 can be obtained:

**Table 1.** Measurement of concentration within the primary sector

Year	production value						HHI
	gross product (million yuan)	agriculture in- dustry	forest in- dustry	ranching industry	fisheries in- dustry	Agriculture, forestry, ani- mal hus- bandry and fishery ser- vices	
2013	26479977	18286298	481323	6472974	171791	1067590	0.538640682
2014	28814769	19829949	493949	7045509	196088	1249273	0.535606481
2015	29683858	20375857	531503	7096735	217787	1461974	0.531142662
2016	31659200	22017390	502781	7207111	221937	1709980	0.538692332
2017	33265927	23132431	542577	7485258	232317	1873345	0.537668949
2018	36377891	25411560	626997	7964225	280872	2094237	0.539565187
2019	38506455	26163038	655599	9152730	275316	2259772	0.521929339
2020	43156058	29363296	659976	10380788	272351	2479647	0.524376357
2021	51431200	34889900	791200	12656900	359500	2733700	0.523872366
2022	54690400	37539800	535000	13052800	321300	3241500	0.531757861

Note: The data source is based on the statistical data calculations from the annual statistics of a western province bureau.

Between 2013 and 2022, the HHI index for the agricultural, forestry, animal husbandry, fishery, and related services industries in a western province fluctuated between 0.52 and 0.54, showing relatively stable fluctuations, indicating a highly concentrated I-type market. The agricultural industry holds a high market share with significant market concentration, prone to monopolies, characterized by few concentrated enterprises and low market competition. Therefore, it is necessary to further utilize biotechnological means to strengthen the mutual influence and cross interactions among agriculture, forestry, animal husbandry, planting, and breeding sectors. The government should implement a series of measures to promote competition and prevent monopolistic behaviors. Through adjustments in industrial structure, upgrades and reforms within the primary sector can be achieved.

## 4.2 Measurement of the Concentration of Regional Specialty Agricultural Industries

When analyzing the concentration of agricultural industries in a western province, the focus is on calculating the concentration of distinctive industries such as cotton, tomatoes, and sugar production, leveraging advantages such as regional environment, cultivation techniques, and significant day-night temperature differences. Due to data limitations, this paper takes several listed agricultural enterprises in a western province as examples, with data sourced from their respective annual reports.

Taking the leading cotton enterprise listed in a western province as an example, we select the production of lint cotton from 2018 to 2022 as the indicator and calculate its HHI value. As shown in table 2:

**Table 2.** Measurement of concentration of listed cotton enterprises in a western province

Year	Gross cotton production(tons)	Xinjiang Sayram Modern Agriculture Co., Ltd.	Xinjiang GuanNong Co.,Ltd.	Xinjiang Talimu Agriculture Development Co., Ltd.	HHI
2018	5111000	52258.67	46684.13	12921.46	0.000194368
2019	5002000	53047.86	41582.53	14089.73	0.000189516
2020	5161000	62145.19	62294.96	12904.37	0.000296938
2021	5129000	58161.27	82926.81	11094.39	0.000394679
2022	5391000	47837.69	50645.18	8510.61	0.000169488

Data source: Compiled from annual reports of various enterprises.

From 2018 to 2022, the concentration ratio of the cotton industry was consistently less than 0.05, indicating a Type II perfectly competitive market with high competition due to the presence of numerous small-scale competitors and relatively small market shares. Enterprises should enhance their competitiveness by relying on technological innovation to improve and extend the cotton industry chain, engage in deep processing, and increase the added value of cotton. Additionally, the government should support leading enterprises, strengthen the driving capacity of industry leaders, and promote the healthy development of the cotton industry.

Taking a leading tomato company listed in a western province as an example, we select the tomato product output from 2018 to 2021 as the indicator to calculate its HHI value. As shown in table 3:

**Table 3.** Concentration Measurement of Listed Tomato Enterprises in a Western Province, Unit: Tons

Year	Total production of tomato products	Xinjiang Guannong Co., Ltd.	Chalkis Health Industry Co.,Ltd.	Cofco Sugar Holding Co.,Ltd.	HHI
2018	3362755	97090.57	8732.73	198300	0.004317758
2019	3883676	112253.75	0	224600	0.004179959
2020	4835777	122380.92	0	253400	0.003386339
2021	3855320	84262.1	58282.8344	221000	0.003992197

Data source: Compiled from annual reports of various enterprises.

From 2018 to 2021, there was a trend of first decreasing and then increasing, with a concentration less than 0.05, belonging to a competitive Type II fully competitive market. As the HHI index decreases, businesses face more intense market competition and smaller market shares. Companies should seek new market opportunities, increase research and development investment in tomato products, extend the tomato industry chain, optimize the quality of tomato products, and enhance their competitiveness. The government should support leading tomato companies, drive the development of small and medium-sized enterprises, and promote the healthy development of the tomato industry.

Taking a leading sugar production enterprise in a western province as an example, we selected the sugar operating revenue from 2018 to 2021 as the indicator to calculate its HHI value. As shown in table 4:

**Table 4.** Concentration Measurement of Listed Sugar Enterprises in a Western Province

Year	Total operating income from sugar(Yuan)	Cofco Sugar Holding Co.,Ltd.	Xinjiang Guannong Co., Ltd.	HHI
2018	3574547000	2106298334	225600063.5	0.351197653
2019	4295474000	2269817672	278473369.3	0.283431371
2020	3467919000	2515660946	190201170.6	0.529226831
2021	3397739000	3383320955	130434894.2	0.993004855

Data source: Compiled from annual reports of various enterprises.

From 2018 to 2021, there was a trend of fluctuation, with the HHI index in 2019 being greater than 0.18 but less than 0.3, categorizing it as a moderately concentrated market type II. In 2018, 2020, and 2021, the concentration was all above 0.3, indicating a highly concentrated market type I. Therefore, the sugar industry in a western province is considered a monopoly market. With ongoing restructuring and mergers in sugar enterprises, the industry's concentration in this western province shows an overall upward trend. Some companies may gain more monopoly profits. At this point, the government should promote market competition, facilitate information sharing, deepen industrial integration, break down industry barriers, extend the industrial chain, reduce concentration, support the participation of small and medium enterprises in market competition, and prevent the formation of monopolistic markets.

## 5 Conclusion

The results indicate that, overall, within the primary sector in a western province, markets tend toward oligopoly. The government should enhance interactions within the primary sector. Cotton and tomato industries operate under conditions of perfect competition. Firms should enhance technological innovation to extend their industrial chains, while the government should bolster the capacity of leading enterprises to drive these efforts. The sugar industry exhibits high oligopoly characteristics. The government should promote information sharing, deepen industry integration among firms,

break down technological barriers, reduce market concentration, support the participation of small and medium-sized enterprises in market competition, and prevent the formation of monopolies. This study provides significant reference value for determining the future development direction of agricultural industries in a western province.

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