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Quantitative Evaluation of Safety of the Chinese Agriculture after Joining the WTO

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Abstract From the international competitiveness of industry, the foreign dependency rate of industrial exports, the foreign dependency rate of industrial imports and foreign equity control rate of industry, we conduct quantitative evaluation of safety of the Chinese agriculture in the period 2002–2009, and compare the evaluation results with the related data prior to joining the WTO, using multi-indicator system analysis method. The results show that after joining the WTO, despite the decline in the safety of Chinese agriculture in the period 2002–2009, the Chinese agriculture is still basically safe, close to the edge of the "unsafety", because some uncertainties mushroom. As a result, we analyze the reason for increase of unsafe factors in the Chinese agriculture after joining the WTO, and put forward the corresponding countermeasures and solutions.

Key words WTO, Safety, Safety countermeasures, The Chinese agriculture

With the accelerated pace of economic globalization, especially the constant expansion and development of investment and trade liberalization, the Chinese agriculture is pitted against increasing external threat in the fierce international competition, the survival and development of which is affected to much extent. In order to comprehensively, accurately and timely reflect the safety and extent of damage of agriculture, it is very necessary for China to establish and improve the evaluation mechanism of agricultural safety, and building the scientific and rational evaluation indicator system of industrial safety is basis of building evaluation system of agricultural safety^[1]. In recent years, the foreign investors continue to initiate cross-border M & A decapitation strike on China's leading agricultural enterprises, therefore, the M & A incidents in meat processing, wine, dairy, beverage and other industries are proliferating. The incidents of foreign investors merging and acquiring China's listed agricultural companies with the widest influence and the newest mode are Changyu A Incident and Goldman Sachs Pig-raising Incident. In 2010, the domestic and foreign capital pushed up cash to speculate in the futures, resulting in hike in the price of corn, green beans, garlic and other agricultural products. It has attracted the attention of the whole society, and the government ceaselessly takes measures to regulate market. Issues concerning the industrial safety of agriculture loom large increasingly.

The industrial safety of agriculture means that effective national action is taken to avoid changes in the internal and external factors imperilling the basic industrial status of the Chinese agriculture in the national economy, to ensure the sustainable

development of agriculture. Through quantitative analysis, evaluation of the industrial safety of agriculture is to conduct objective, accurate and comprehensive evaluation of agricultural safety in a certain period, using specific indicator system in accordance with certain procedures. Through a series of indicators influencing survival and development of agriculture, it is to carry out monitoring, evaluation and analysis, so that the safety and extent of damage of agriculture are accurately and quickly reflected, the government and industrial circles work out corresponding effective agricultural development policies, and take timely measures to protect the industrial safety of agriculture^[2].

1 Indicator selection, data source and research method

1.1 Indicator selection We conduct overall evaluation of the safety of Chinese agriculture, and focus on the evaluation of control force of industry, the foreign dependency rate of industry, and the international competitiveness of industry. We use the indicator of the control rate of foreign equity of industry to evaluate control force of industry; use the indicators of the foreign dependency rate of industrial exports and the foreign dependency rate of industrial imports to evaluate the foreign dependency rate of industry; use the world market relative performance index to evaluate the international competitiveness of industry.

1.1.1 Evaluation indicator of agricultural control force.

1.1.1.1 The foreign dependency rate of industrial capital. It is measured by the ratio of foreign capital stock of the domestic agricultural industry and total capital stock of agriculture at the end of the year.

1.1.1.2 The control rate of foreign equity. Because the assets-liabilities ratio of some domestic-funded enterprises is too high, using the output value for calculation will underestimate foreign equity control force. In addition, it is not in line with China's situation after joining the WTO. Therefore, the control

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rate of foreign equity is calculated using the ratio of registered capital of the foreign-funded enterprises and registered capital of all enterprises.

1.1.2 Evaluation indicator of foreign dependency of agriculture.

1.1.2.1 The foreign dependency rate of agricultural exports. It is measured by the ratio of exports of one certain domestic industry and the total output value of the industry in the same year.

1.1.2.2 The foreign dependency rate of agricultural imports. It is measured by the ratio of imports of one certain domestic industry and the total output value of the industry in the same year.

1.1.3 Evaluation indicator of the international competitiveness of agriculture.

1.1.3.1 Relative market performance index. The relative performance index of world market is measured by the ratio of share of exports of one domestic industrial product in exports of this industrial product in the world, to share of exports of all domestic industrial products in the total global exports.

1.1.3.2 The world market share of agricultural exports. It is measured by the ratio of exports of one domestic industry to the total exports of this industry in the world market.

1.2 Data source The related data are from *International Statistical Yearbook*^[3], *Yearbook of the World Economy*^[4], *China Economic Yearbook*^[5], *China Statistical Yearbook*^[6], *China Agricultural Yearbook*^[7], *China Rural Statistical Yearbook*^[8] (Due to the lag of the statistical yearbook, the data are up to 2009, and the default data are replaced by mean). The amount of capital involved does not include the capital and debt capital of unregistered enterprises, and it refers to the amount of registered capital of registered enterprises. As for the foreign sum, it is translated according to the current exchange rate.

1.3 Research method By referring to the research method of literature^[9], it has continuity and comparability. China's agriculture is based on farmers' decentralized operations, thus using registered capital of registered enterprises to calculate "the foreign dependency rate of industrial capital" lacks representativeness. We substitute "the foreign dependency rate of industrial imports" for the indicator of "the foreign dependency rate of industrial capital", to research the changes in safety situation of the Chinese agriculture in the period 2002–2009.

Benefiting from the multi-indicator system method by the research institutions of the international industrial competitiveness, the World Economic Forum (WEF) and the International Management Development Institute (IMD), in integrating the international competitiveness, we establish the assessment model of the industrial safety of agriculture as follows:

$$S = \alpha W + \beta X + \lambda Y + \theta Z \quad (1)$$

where S is the industrial safety; W is the evaluation value of the international competitiveness of agriculture; X is the foreign dependency rate of agricultural exports; Y is the foreign dependency rate of agricultural imports; Z is the control rate of agricultural foreign equity; $\alpha = 40\%$, $\beta = 15\%$, $\lambda = 15\%$, $\theta = 30\%$, which are the weight coefficients of various first-level indicators

and the weight value assessed by experts, needing to satisfy $\alpha + \beta + \lambda + \theta = 1$.

2 Results and analysis

2.1 Evaluation of international competitiveness of the Chinese agriculture Evaluation results of international competitiveness of the Chinese agriculture in the period 2002–2009 can be seen in Table 1. Table 1 shows that due to the rising costs and prices of agricultural products in China, although the accession to the WTO brings the Chinese agriculture open markets, China's agricultural products gradually lose competitive edge. In the first two years after China joined the WTO (the period 2002–2003), the world market share of the Chinese agriculture rose to some extent, followed by a slow downward trend.

The average evaluation value of international competitiveness of the Chinese agriculture in the period 2002–2009 was only 52.5, and according to the study of Xu Jiexiang^[10], in 2000, the world market share of the Chinese agricultural exports was 4.26%, the relative performance index of world market of the Chinese agriculture was 106.4, and the evaluation score of international competitiveness of the Chinese agriculture was 90, with evaluation result of "very good". Thus it indicates that since accession to the WTO, the relative performance index of the Chinese agriculture in the world market has shown a clear downward trend, and international competitiveness of the Chinese agriculture has declined.

Table 1 Evaluation results of international competitiveness of the Chinese agriculture in the period 2002–2009

Year	The world market share of the Chinese agricultural exports//%	The relative world market performance index of the Chinese agriculture//%	Evaluation	Score
2002	3.28	65.60	Good	70
2003	3.21	56.31	Good	70
2004	2.85	44.53	Average	50
2005	3.13	43.47	Average	50
2006	4.29	53.63	Good	70
2007	3.26	48.85	Average	50
2008	2.95	39.33	Poor	30
2009	2.68	37.82	Poor	30

2.2 Evaluation of the foreign dependency rate of the Chinese agriculture In accordance with the research of He Weida^[9], the foreign dependency rate of industrial exports in the period 1995–2000 was not high, 6.63%, 5.95%, 5.91%, 5.20%, 5.16%, and 5.85%, respectively. In 2000, the foreign dependency rate of agricultural imports was 8.67%^[10]. In the period 2002–2009, the foreign dependency rate of the Chinese agricultural imports and exports experienced upward trend (Table 2): the foreign dependency rate of agricultural imports increased from 8.05% in 2002 to 13.6% in 2009; the foreign dependency rate of agricultural exports increased from 7.23% in 2002 to 8.72% in 2009, culminating in 2006 at 9.78%. It indicates that after China's accession to the WTO, the contact with other countries in the world has been strengthened.

Table 2 The foreign dependency rate of the Chinese agricultural imports and exports in the period 2002 – 2009

Year	The foreign dependency rate of the Chinese agricultural imports			The foreign dependency rate of the Chinese agricultural exports		
	The foreign dependency rate//%	Evaluation	Score	The foreign dependency rate//%	Evaluation	Score
2002	8.05	Very good	90	7.23	Good	70
2003	11.20	Good	70	8.03	Average	50
2004	12.69	Average	50	6.69	Good	70
2005	11.70	Good	70	7.17	Good	70
2006	11.93	Good	70	9.78	Average	50
2007	10.76	Good	70	9.61	Average	50
2008	12.93	Average	50	9.25	Average	50
2009	13.60	Average	50	8.72	Average	50

2.3 Evaluation of the control force of the Chinese agriculture

We use the control rate of foreign equity to evaluate China's control force of industry. In accordance with the study of He Weida *et al.*, in the period 1995 – 2000, the control rate of foreign equity of the Chinese agriculture is 36.33%, 33.19%, 36.63%, 25.12%, 26.18%, 30.23% respectively, with evaluation result of "good"^[9]. From Table 3, in the period 2002 – 2004, the control rate of foreign equity of the Chinese agriculture is 32.83%, 31.92%, 39.34% respectively, with evaluation result of "very good". In 2008 and 2009, the control rate of foreign equity of the Chinese agriculture is increased to 50.12% and 52.37%, with evaluation result of "average". This shows that since the accession to the WTO, the control force of the Chinese agriculture has declined. It must be noted here that using the registered capital of the registered enterprises to calculate the control rate of foreign equity, will underestimate the result in fact, because the Chinese agriculture is based on decentralized operation by farmers, thus we should appropriately elevate the evaluation of it.

2.4 Estimation of safety of the Chinese agriculture By referring to the study of He Weida^[9], we give the corresponding evaluation values (90, 70, 50, 30, 10) to the evaluation results of various indicators (good, very good, average, poor, very poor), respectively, and assign the corresponding weight (40, 15, 15, 30) to 4 indicators (the international competitiveness of industry evaluation, the foreign dependency rate of industrial exports, the foreign dependency rate of industrial cap-

ital, and the control rate of foreign equity of industry). We calculate the safety of Chinese industry using the weighted average method. For the general industries, when the safety evaluation values are in interval [85, 100], [65, 84], [45, 64], [25, 4] and [0, 2], we will define this industry as "very safe", "safe", "basically safe", "unsafe", and "very unsafe". Since the internal factors of the Chinese agriculture have great impact on the industrial safety of agriculture, we promote the threshold level of the industry, that is, when safety evaluation values are in interval [90, 100], [75, 89], [60, 74], [40, 59] and [0, 39], we will define the industry as "very safe", "safe", "basically safe", "unsafe", and "very unsafe", as shown in (Table 4).

Table 3 The control rate of foreign equity of the Chinese agriculture in the period 2002 – 2009

Year	The control rate of foreign equity of the Chinese agriculture//%	Evaluation	Score
2002	32.83	Very good	90
2003	31.92	Very good	90
2004	39.34	Very good	90
2005	42.22	Good	70
2006	42.78	Good	70
2007	43.39	Good	70
2008	50.12	Average	50
2009	52.37	Average	50

Table 4 Evaluation parameters and precautionary measures of agricultural industry's safety

Safety domain	State identification	Early warning signal	Corresponding measures
[90, 100]	Very safe	Greenish-light zone	Maintaining strength and developing steadily
[75, 89]	Safe	Red-light zone	Continuing to develop and increasing benefit
[60, 74]	Basically safe	Yellow-light zone	Paying close attention to emergence of unsafe factors
[40, 59]	Unsafe	Red-light zone	Adopting measures and reversing the situation
[0, 39]	Quite unsafe	Mauve-light zone	Taking measures and heading off disasters

According to evaluation scores in Table 1 – 3, through calculation we get the estimate and early warning results using model (1), combined with Table 4: the international competitiveness of agriculture (W) is 52.5; the foreign dependency rate of agricultural exports (X) is 57.5; the foreign dependency rate of agricultural imports (Y) is 65; the control rate of foreign equity of agriculture (Z) is 72.5. Thus, we get the results by evaluation: the agricultural safety (S) is 61; the state identification is "basically safe"; the warning signal is displayed in the

yellow-light zone.

According to the study results of He Weida, the score of safety of the Chinese agriculture was 62 in the period 1995 – 2000, in the range of basic safety. After joining the WTO, in the period 2002 – 2009, the score of safety of the Chinese agriculture was 61. Although the safety of Chinese agriculture declined to some extent, the Chinese agriculture was still in the range of "basic safety", close to 59 points, the edge of "unsafety", because some unsafe factors increased.

3 Analysis of the reason for increase of unsafe factors in the Chinese agriculture after joining the WTO

3.1 Impact of accession to the WTO on production of agricultural products The core of the industrial safety of agriculture is food security. In the 1990s, on the whole, the domestic prices of China's food was less than prices in the international market, and the food products have competitive advantage in terms of price. But, in recent years, China's production costs increase with an average annual rate of 10%, and the prices in the domestic market are skyrocketing, therefore the competitiveness advantage of China's food price has completely disappeared, and food crops no longer have comparative advantage. Since October 2003, China's grain prices have increased sharply, thus China's food security issues once again draw a wide range of great concern.

3.2 Impact of accession to the WTO on farmers' income China's accession to the WTO has a great impact on employment of the rural labor force, affecting the income of the farmers. Although China is a great country of producing agricultural products in the world, the share of exports of China's agricultural products in the world market share is still small. Taking animal product as an example, in 2003, the meat exports (overall) in China only accounted for 1.45% of the world market share.

In 2008, China's meat trade continued the trend of substantial increase in imports, and the growth rate of imports was far greater than that of exports. The cumulative export volume of meat is \$ 3.116 billion, an increase of 9.0%; the cumulative import volume of meat is \$ 2.561 billion, an increase of 50.3%, with the trade surplus of \$ 555 million, a decrease of \$ 601 million compared with the previous year. Pork and poultry show the trade deficit, and the lamb deficit is widening^[11]. In the agricultural products for export, a considerable portion of them are low-value products and low value-added products, and high-value agricultural products such as animal products are difficult to be exported in bulk because of the poor health and safety status, so that the export performance of agricultural products, which take promoting employment of rural labor force, increasing farmers' income and enhancing agricultural competitiveness as a starting point and value objective, fails to be achieved^[12]. In terms of imports, because the primary products have a large share in import, it is estimated that the impact of imports on farmers makes the farmers reduce the market share in the neighbourhood of 4%. In the past few years, since the supply of considerable agricultural products exceeds the demand and the prices decline, the income of farmers from agriculture decreases, making the per capita income of farmers in major grain producing areas decrease by 100 – 120 yuan, and making it particular difficult for increase in the income of agriculture-based pure rural households.

3.3 Impact of accession to the WTO on the competitiveness of agricultural products There are many unfavorable factors for the Chinese agriculture to participate in the international market competition, including low organizational degree of farmers, small production scale, poor natural conditions, low

scientific and technological content in agriculture and low level of agricultural input, leading to low quality and weak competitiveness of China's agricultural products, especially looming large after joining the WTO.

Since the price of the majority of land-intensive agricultural products in China rises rapidly and exceeds the international market price, China's labor-intensive agricultural products have clear comparative advantage, but part of the labor-intensive agricultural products have no competitive advantage in the international market, because the quality of agricultural products is not high (far from reaching the requirements of consumers in developed countries, leading to decline in the quality, price of agricultural products, and the competitiveness of agricultural products^[13]).

3.4 Impact of accession to the WTO on China's trade of agricultural products Since the accession to the WTO, the import and export of agricultural products in China have experienced a dramatic increase, but the growth rate of imports is greater than that of exports. In 2004, the exports of agricultural products grew by only 9.1%, while the imports of agricultural products grew by 48.1%, so that China's agricultural products changed from long-term surplus into continuous state of deficit. In 2008, the foreign trade deficit of agricultural products reached \$ 18.16 billion, a year of the largest deficit in the Chinese history.

3.5 Impact of accession to the WTO on agricultural support policy and the means of agricultural protection The average tariff rate of China's agricultural products, declines from 23.2% prior to accession to the WTO, to 15.35% in 2005. The world's average tariff level of agricultural products is 62%, and China has become one of the countries with the lowest tariffs of agricultural products, increasing pressure on the imports of agricultural products. When joining the WTO, China made the following commitments: greatly curtailing tariff, immediately stopping the use of export subsidies, implementing tariff quota system management on the export of some important agricultural imports, limiting the expenditure of domestic support to agriculture, regulating the technical standards of food safety and quarantine of animal and plant and so on. We should fulfil these commitments so that the degree of openness of China's agricultural product market is much higher than that of most developing countries, in some ways even higher than that of major developed countries^[14].

4 Recommendations

At present, the international competitiveness of the Chinese agriculture lags behind that of some developed countries, and there is obvious gap in agricultural infrastructure, agricultural science and technology input, the quality of the agricultural laborers, agricultural productivity, the organizational degree of agricultural cooperation, government support, resource endowments and so on. However, the Chinese agriculture has obvious advantages in terms of the agricultural value added, the amount of labor forces, the development of agricultural production and other aspects. From the future development trends,

with the intensified basic status of agriculture, continuous and rapid economic growth in China, the international competitiveness of the Chinese agriculture will be greatly improved.

4.1 Strengthening government services and improving the quality of agricultural products The State Council should determine the dominant position of the Ministry of Agriculture in quality safety management of the agricultural products, to establish complete and effective administrative institutions, rationalize the quality safety supervision system of agricultural products, and implement the whole process of quality management "from the field to table". We should make good use of the "amber box" policy, "green box" policy and other protective and supportive policies consistent with multilateral rules offered by the WTO to the Chinese agriculture. We should shift the agricultural subsidies from the field of circulation of agricultural products to the field of agricultural production, gradually shift from protecting the agricultural-production-based subsidies to increasing farmers' income-based subsidies, to enhance the competitiveness of agricultural products and increase farmers' income in China. We should strengthen the construction of related laws and regulations of quality safety of agricultural products, make rational use of anti-dumping and anti-trust regulations; strengthen international cooperation and exchange on quality safety of agricultural products, and get rid of the foreign technical barriers; not only improve the quality of agricultural products in China, but also actively participate in the new round of WTO negotiation and strengthen consultations and negotiations with the import side, so that the use of technical barriers tends to be rationalized.

4.2 Strengthening macro-control and strengthening the anti-risk ability of agriculture We should give full play to the role of the government in macro-control over agricultural product markets, adjust the policy orientation of agricultural financial expenditure, strengthen the construction of agricultural insurance system. The total agricultural regulation-based input should be based on the goal of agricultural development and variation trend of agricultural markets. The government should use modern equipment and information networks, to provide the basic information and information analysis of production, market supply and demand, price changes of all kinds of agricultural products in the world; establish the sound early warning system of agricultural production and agricultural product markets, to track and monitor the foreign dependency rate of agriculture, changes in agro-ecological environment, agricultural resources and so on, and give an alarm when there are possible fluctuations, in order to conduct reverse adjustment of the factors disturbing agricultural production, achieve the goal of rapid, continuous and stable development of agriculture. We should shift the funds for subsidizing the state-owned grain departments to the links of agricultural production, reduce the extra cost of agricultural production^[15]; continue to increase investment in agricultural infrastructure, constantly improve and enhance the conditions for agricultural production, and develop agricultural insurance to enhance the anti-risk ability of agriculture.

4.3 Encouraging institutional innovation of agricultural production organizations and strengthening education and training for farmers We should strengthen education and training for farmers, and improve the quality of farmers as quickly as possible; speed up the transfer of China's agricultural labor to non-agricultural industries; improve the forms of industrial organization integrating farming and breeding farmers, marketing and processing enterprises that adapt to China's specific conditions as quickly as possible. Only when achieving large-scale and intensive agricultural production, can the agricultural labor productivity be substantially improved, the external shocks be withstood, and the income of agricultural producers be increased^[16].

4.4 Adjusting the industrial structure of agriculture in accordance with the principles of superior products We should focus on the strategic adjustment of three levels, namely, the strategic adjustment of industry structure of agriculture, forestry, animal husbandry, fishery; the structure of varieties; the structure of regional layout. It not only includes the adjustment of agricultural and non-agricultural structure, the adjustment of agricultural planting structure, but also includes the adjustment of rural and urban structure, the adjustment of the breadth and depth of industrial development, the adjustment of agricultural organization structure, the improvement of the processing and circulation system. We should promote virtuous industrial circle and rationalization of internal industrial structure of the Chinese agriculture, thereby enhancing the international competitiveness of China's agricultural industry.

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sity policy of forestry development and ecological protection in the northwest Sichuan plateau pastoral area.

4.4 Developing basic public service with the aid of external forces Practice has proved that the counterpart assistance of economic developed regions for ethnic minority areas fully reflects the socialist superiority, and it is an important measure to bring into full play the advantages of developed regions and promote coordinated development of all regions. This is further proved in rehabilitation works after "May 12" Wenchuan Great Earthquake. However, this policy is still to be improved. In the first place, the scope of support should be expanded. The pattern of China's counterpart assistance was established in the end of the 1970s and at the beginning of the 1980s. Beijing assists Inner Mongolia, Hebei supports Guizhou, Jiangsu helps Guangxi and Xinjiang, Shandong supports Qinghai, Tianjin assists Gansu, Shanghai supports Yunnan and Ningxia, and the whole country supports Tibet, but no counterpart assistance is arranged for the northwest Sichuan plateau pastoral area at upstream Yangtze River. Thus, it is required to make proper adjustment to provide counterpart assistance for this area and strengthen the support at the same time. When implementing the counterpart assistance at provincial level, take developed cities (counties or districts) of developed provinces and coastal areas as major subjects, to bring into play their functions in helping socio-economic development and improving basic public service level of this area. In the course of counterpart assistance, it is required to organically integrate the assistance in developing economy and in developing basic public service. We should fully utilize resource advantages to handle concrete affairs in developing basic public services of the northwest Sichuan plateau pastoral area. Furthermore, it is proposed to establish incentive mechanism, seek donation from various circles of society and international support, to expand channels of basic public services in the northwest Sichuan plateau pastoral area.

4.5 Intensifying evaluation system for supervision of social construction works With strict adherence to Scientific Outlook on Development as guidance, it is required to establish and perfect planning, inspection and evaluation mechanism for social construction, establish and perfect scientific and reason-

able evaluation system for assessing social construction works, stress indexes of social construction, livelihood and enriching people, organically combine performance assessment and social construction assessment, finally to guide leading cadres at all levels to the road of promoting scientific and harmonious development. Besides, we should establish evaluation system for performance of social construction, perfect supervision and feedback mechanism of public decision making and implementation, and constantly improve social construction ability and working level. Also, it is to further improve social supervision mechanism, establish information network platform for social construction, to timely pinpoint and solve problems. It is expected to provide powerful guarantee for building harmonious society through enhancing institutional construction^[11].

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