

# Study on the Development Dilemma of Prefabricated Vegetable Industry and the Path of Legal Regulation

Yang Huikang<sup>1</sup>, Chen Xiaoye<sup>2</sup>, Shen Xiangyu<sup>3</sup>, Xia Lifang<sup>3</sup> & Wang Qi<sup>3</sup>

<sup>1</sup> Law School, University of Glasgow, Glasgow, Kingdom United

<sup>2</sup> School of Intellectual Property, East China University of Political Science and Law, Shanghai, China

<sup>3</sup> School of Law, Qufu Normal University, Rizhao, China

Correspondence: Chen Xiaoye, School of Intellectual Property, East China University of Political Science and Law, Shanghai, China.

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## Abstract

Food safety public opinion in the prepared vegetable industry has a negative impact on the development of the industry. The lack of industry as well as school lunch standards, the absence of industry self-regulation, the inadequacy of the regulatory system and the low transparency of information are the deep-seated reasons for the outbreak of negative public opinion in the prepared vegetable industry. The healthy development of the prepared vegetable industry requires the joint efforts of many parties. The systematic construction of the standard system is an important prerequisite for the orderly development of the prepared vegetable industry; the real performance of industry self-regulation is the internal incentive for the development of the prepared vegetable industry; the improvement and perfection of regulatory measures and early warning mechanism is the external guarantee for the development of the prepared vegetable industry; and the effective disclosure of product information can help to increase the participation rate of the public in supervision, which will in turn stimulate the effective implementation of the industry self-regulation and the governmental supervision, and realise the pluralistic and common governance of the prepared vegetable industry. The effective disclosure of product information can help improve the participation rate of public supervision, which in turn can stimulate the effective implementation of industry self-regulation and government supervision, and realise the multi-dimensional governance of the prepared vegetable industry.

**Keywords:** prefabricated vegetables, standard construction, industry self-regulation, public traceability

## 1. Introduction

Prepared food refers to agricultural, livestock, poultry and aquatic products as raw materials, with a variety of auxiliary materials for pre-processing or pre-cooking of finished or semi-finished products, packaged in room temperature, refrigerated or frozen conditions for storage, transport and sale, can be consumed directly or after simple cooking, as a daily meal to eat [1]. Its time-saving and convenient features make many consumers tend to choose prepared food products under the fast-paced lifestyle [2], and its standardised meal preparation mode is also in line with the demand for campus lunch meals, so there is a huge potential for development of the related market [3]. However, because the industrial chain of prepared dishes is more complex than the general food processing chain, and the product radiation range is wider, it is easy to appear larger food safety incidents (In Saitama Prefecture, Japan, 3,453 students and teachers from 15 elementary and middle schools suffered from abdominal pain and diarrhoea after eating a lunch of prepared food consisting of fried chicken and seaweed provided by the city's "Eastern Food Service Centre". See also 3,400 people suffered from food poisoning at the school's food service, and three people from the food service industry were sent to the hospital for testing...Water is used for the treatment of seaweed, which is a pathogen of coliform bacteria[N/OL]. Yomiuri News. (2023-01-06)[2023-10-20]<https://www.yomiuri.co.jp/national/20230106-OYT1>), triggering negative public opinion at the social level, affecting the long-term development of the industry, so in order to safeguard the public's food health and safety, this paper intends to explore the current development of the prepared dish industry in China encountered difficulties and solutions.

## 2. Current Development Dilemma of the Prepared Vegetable Industry

Prefabricated vegetable industry in China is in a good position in the early stage. As a typical paradigm of industrial integration, the prepared food industry has received policy support from Shandong Province[4] and Guangdong Province[5] in recent years, and the No.1 Document of the Central Government in 2023 also pointed out that it should "cultivate and develop the prepared food industry"[6]. Its convenience and diversity[7] have indeed attracted many consumers. According to a survey of 1,452 consumers(The survey team took a sampling approach and randomly sent out 2,000 questionnaires on the development of the prepared vegetable industry, with a total of 1,452 valid questionnaires returned.), 96.76% have purchased prepared food (Figure 1), and 34.03% of respondents have consumed prepared food at a high frequency (more than seven times per week) (Figure 2). Nevertheless, compared with the high penetration rate of Japan and the United States market[8], China's current market penetration rate of prepared dishes is only 15%[9], with great room for expansion, the market has a broad prospect and strong momentum, only in 2020 the number of new registered enterprises will be as high as 12,900[1], the market value of the concept of prepared dishes stocks has also significantly outperformed the same period of the Shanghai Stock Exchange Index[10]. Currently, the prepared food industry is developing at a high speed with an annual growth rate of about 20%, and is expected to become the next trillion-dollar market[1]. The rapid development of the industry has also left behind hidden food safety problems(For example, in 2023, there was a problem in Rongjiang New District, Ganzhou City, Jiangxi Province, where hundreds of children ate late and had diarrhoea on the first day of school due to the untimely delivery of meals from central kitchens and a shortage of service staff, which caused extensive discussion on the Internet. See [11] CNN. Parents quit their jobs to deliver meals amid fears of pre-prepared food in schools [N/OL]. CCTV. (2023-09-18)[2023-10-05]. <https://edu.cctv.com/2023/09/18/ARTIu9UGjsjKL4iq7MtISGNu230918.shtml>.), affecting consumer attitudes towards the industry, in this questionnaire, 38.15 per cent of consumers expressed concerns about the food safety of prepared dishes (Figure 3).

Have you ever purchased prepared dishes?



Figure 1. Statistics on the Purchase of Prepared Vegetables

How often do you eat prepared meals per week?

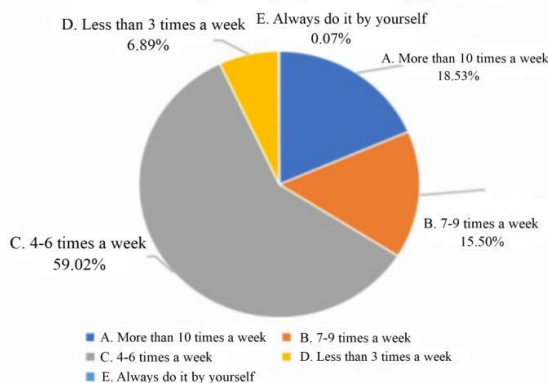


Figure 2. Statistics on the Frequency of Consumption of Prepared Vegetables

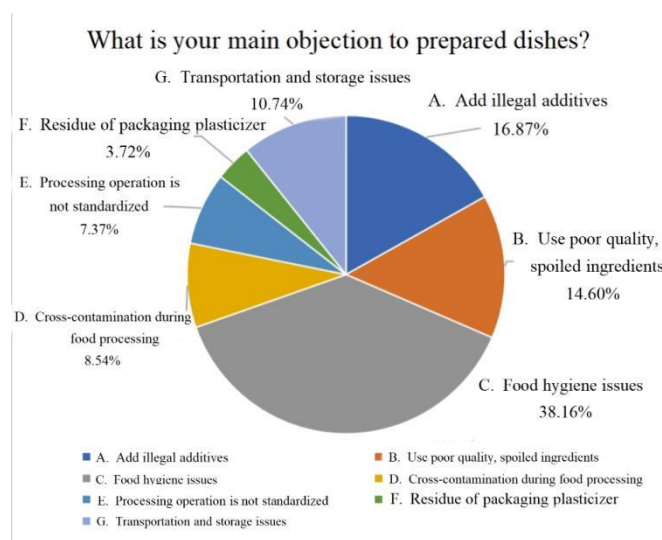


Figure 3. Negative views of prepared vegetables Statistical charts

Unlike traditional food processing, current prepared food uses many technologies to achieve standardised production, such as novel targeted bacterial reduction, flavour development and retention, rapid pre-cooling, air-conditioned packaging and preservation, and temperature-controlled cold-chain distribution [11], and operational errors in any of these processes may lead to an increase in the risk of food safety of the final product of the batch, and due to the public's lack of understanding of the industry and the technology, there is greater concern about food safety issues of this type of scaled product. Due to the lack of public understanding of the industry and the technology, the public is more concerned about the food safety of such large-scale products, and when a potential risk arises, a wide range of negative public opinion is triggered. 73.55% of the respondents admitted that the public opinion related to the prepared dishes did affect their trust in the industry to a certain extent (Figure 4). An impaired level of trust then reduces consumers' willingness to buy [12], with 25.00 per cent of consumers stating that they would not continue to buy prepared dishes after the incident of prepared dishes in schools (Figure 5). Negative consumer attitudes will wrongly hurt other operators in the industry and affect the overall development of the industry. From the stock market, the concept of prepared vegetables sector has fallen for several consecutive trading days since 19 September 2023 [13], with an overall drop of 0.14% by the close of trading on 27 September [14].

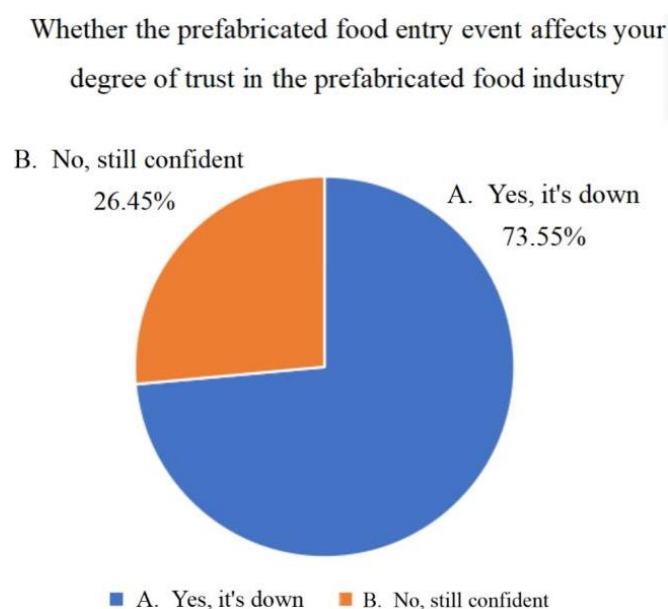


Figure 4. Survey Statistics of Negative Public Opinion on Industry Trust Level

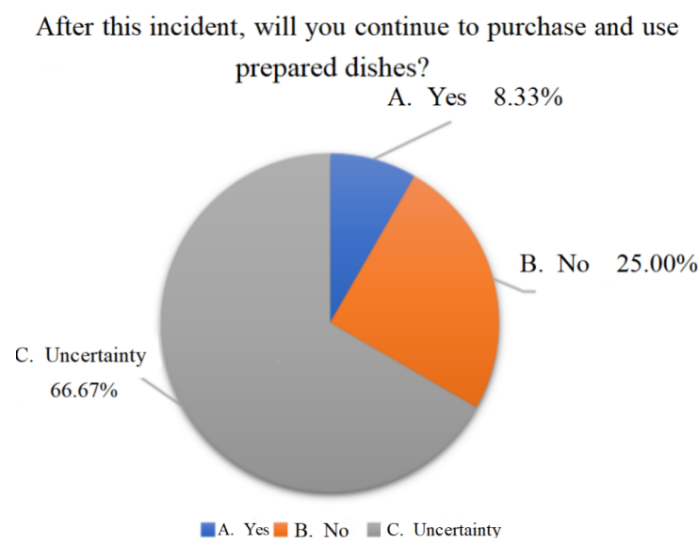


Figure 5. Survey Statistics of Consumers' Willingness to Continue Purchasing

However, the pre-prepared vegetable industry has a very high development value. Prepared vegetables can not only benefit the consumer groups under the fast-paced mode, but also serve as a successful paradigm of industrial integration and development, connecting the field and the dining table, which is also in line with the national policy direction of striving to promote the integrated development of primary, secondary and tertiary industries<sup>[18]</sup>, and fits into the general background of the current industrial integration [15] [16] [17]. The model is also a development model and form of industrial organisation to improve productivity and competitiveness, which is conducive to improving agricultural competitiveness and increasing farmers' income, as well as promoting the further development of the catering industry. In other words, ensuring the high quality development of the prepared vegetable industry helps to achieve a win-win situation for society. Therefore, it is necessary to deeply analyse the deep-rooted contradictions implied in the fast-developing prepared vegetable industry, probe into the operation of the institutional guarantee mechanism, and put forward practical measures with practical value, in order to provide advice for the benign development of the prepared vegetable industry, and to better guarantee that the prepared vegetables can be healthy and safe to the public's table.

### 3. Analysis of the Causes of the Development Dilemma of the Prepared Vegetable Industry

Prepared vegetables into the campus incident is the current prepared vegetables food safety public opinion outbreak of the fuse, the negative public opinion caused by the current prepared vegetables industry is facing the main dilemma. However, only through in-depth analysis of the causes of the current predicament of the prepared vegetable industry, we can put forward targeted measures to solve the problem and protect the long-term development of the prepared vegetable industry.

#### 3.1 Lack of Mandatory Reference Standards for the Development of the Prefabricated Vegetable Industry

Standardisation is an important guarantee for the standardised development of the industry, and the construction of the standard system for prepared vegetables determines the threshold and development prospects of the prepared vegetable industry, and the current standardisation of the prepared vegetable industry in China is not yet sufficient, resulting in a lack of reference standards for industrial development.

##### 3.1.1 Prefabricated Vegetable Standard System is not Yet Sound

As prepared dishes, especially seasoned and ready-to-eat prepared dishes, come in a variety of product types, the production process is complex, but there is no complete national standard to regulate the technology and production process of prepared dishes. Of the 13 "local standards" provided in the report, only eight are local standards in the legal sense issued by government departments (Table 1), showing sporadic dispersion but overall more concentrated in the southern region (The eight local standards are concentrated in the Yangtze River Delta region, including Shanghai and Jiangsu, the Huainan region, including Guangdong and Fujian, and Chongqing Municipality.) However, due to the obvious territoriality of the effectiveness of the local standards, there is still no standard for prepared dishes in most regions to regulate. The content of the current local standards is also in a fragmented state. Most of the local policies are more inclined to invoke the existing national standards related to pre-packaging in their production standards, but national standards such as pre-packaging do not yet meet the

standard requirements of "reducing the risk of food safety of prepared vegetables" and "long-term development of the industry".

Table 1. Summary of 8 Local Standards Policies in the Prepared Vegetable Industry Report

Province/city	Title of document	Release Date
Jiangsu Province	Jiangsu Province Consumer Protection Commission and other units jointly drafted "the quality of pre-prepared dishes to evaluate the norms" of the country's first pre-prepared dishes group standards released	2022/5/19
Guangxi autonomous region in south China	Nanning City Market Supervision Administration on the approval of the release of "terminology of prepared dishes" and other 3 local standards notice	2022/5/31
Fujian Province	Fujian Provincial Health Commission Notice on the Publication of Fujian Provincial Food Safety Local Standard for Goldenrod (DBS35/006-2022) Fujian Provincial Food Safety Local Standard for Fojiao Wall (DBS35/007-2022)	2022/6/2
Guangdong Province	Guangdong projects to formulate five local standards, including "Terminology and Classification Requirements for Prepared Dishes", "General Requirements for Packaging Labelling of Prepared Dishes of Cantonese Cuisine", "Norms for Sensory Evaluation of Prepared Dishes", "Guidelines for Construction of Prepared Dishes Industrial Parks", and "Norms for Cold Chain Distribution of Prepared Dishes".	2022/7/22
Chongqing	Chongqing Municipal Market Supervision Bureau released the production and operation of prepared dishes "the implementation of food safety main responsibility of the twenty articles	2022/11/28
Shanghai	Shanghai Municipal Market Supervision Administration on the release of the "Shanghai pre-cooked vegetables production permit review programme" notice	2023/1/9
Shanghai, Jiangsu, Zhejiang and Anhui Provinces	Shanghai Municipal Market Supervision Administration Jiangsu Provincial Market Supervision Administration Zhejiang Provincial Market Supervision Administration Anhui Provincial Market Supervision Administration on the issuance of the "Guidelines for the Review of Manufacturing Licences of Prepared Dishes in the Yangtze River Delta	2023/1/20
Chongqing	Guidelines for the Construction of Industrial Parks for Prepared Vegetables, Code of Conduct for the Production and Processing of Prepared Vegetables and Standard System for the Safety Supervision of the Production and Operation of Prepared Vegetables	2023/2/28

### 3.1.2 Self-Consistency of Local Standards Needs to be Improved

Some regions have also attempted to develop more demanding standards for prepared dishes. In Guangdong Province, for example, the cities of Zhaoqing, Shaoguan, Chaozhou, Zhanjiang, and Foshan have developed their own local standards systems for prepared dishes. In the absence of a national standard as a basis for development, the content of local standards for prepared vegetables has diverged. And even within a specific region, the self-consistency of its normative content needs to be improved. For example, enterprises in Zhaoqing City generally use a combination of their own base supply and market-based purchasing to guarantee the supply of raw materials, but the standards between bases and between bases and markets are not completely consistent, and the lack of standards also leads to difficulties in guaranteeing the security of raw material supply [19].

### 3.1.3 Group Standards do not Provide a Safeguard Role

As of October 2023, a total of 48 currently valid enterprise standards were published on the public service platform for enterprise information standards (Table 2). A total of 148 currently valid group standards have been published on the national group information standards platform, of which 20 have been released by national associations and 128 by local associations (Table 3). The timely formulation of standards by groups and enterprises can provide greater assistance to industrial development, open up communication channels among enterprises, promote technical exchanges among enterprises to a certain extent, save time and costs, and help industrial development.

However, group standards emphasise leading and innovation, and enterprise standards focus on improving quality [20]. Both are recommended standards and are not mandatory. Therefore, even group standards issued by national associations cannot be required to be enforced by association members, and cannot replace the basic guarantee role of national mandatory standards.

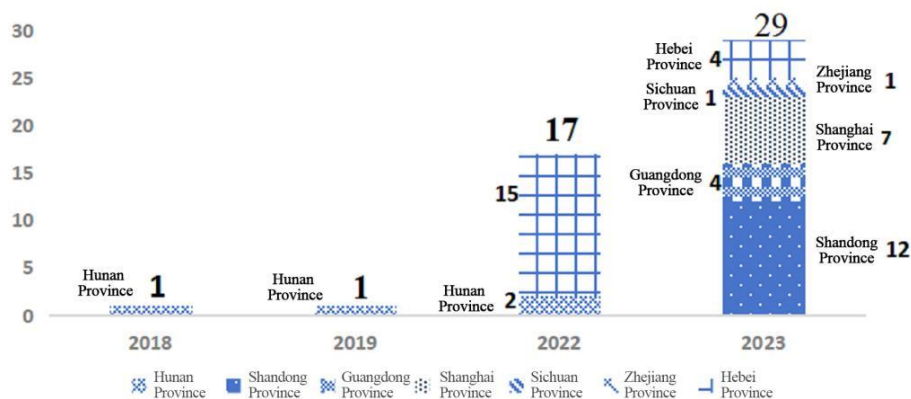


Table 2. Summary of Enterprise Standards for Prepared Vegetables

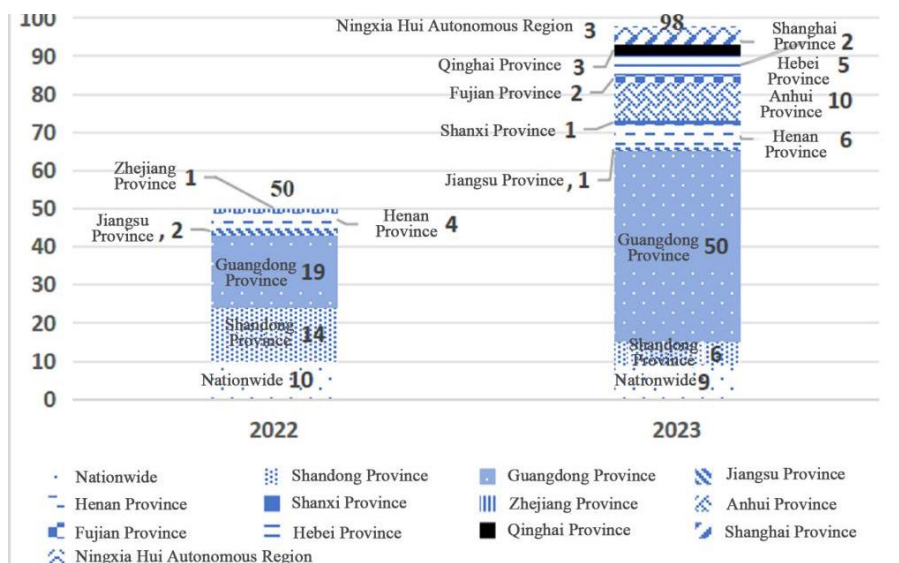


Table 3. Summary of Group Standards for Prepared Dishes

### 3.1.4 The Lack of Campus Lunch Standards

Prepared food is not off-limits to schools. In fact, under the premise of ensuring the freshness, safety and nutrition of the ingredients, and taking into account the reasonableness of the preservation method and the length of transport, the mode of unified production and distribution of central kitchens to campuses can fully guarantee that students can consume fresh and nutritious lunches. This model is also in line with the large number of schools in China and centralised, the campus covers a small area but has a large number of teachers and students [21], has the feasibility of promoting in the campus. However, the prerequisite for its entry into school campuses is to ensure that students in their growth stage consume sufficient healthy food and nutrition. The current national standards ensure that prepared food products meet the safety bottom line, but safety is not the same as health. The lack of standards for school lunches in China is also a major dilemma for central kitchens and other standardised catering models of prepared food products to enter schools.

The legislative provisions for school lunch standards in China need to be improved. Although the importance of school meals has long been noted and the Measures for Hygienic Supervision of Students' Collective Meals were issued in 1996, the prevalence rate was limited due to economic development. In 2019, the Ministry of Education, in conjunction with other ministries, formulated the Regulations on the Management of Food Safety and



Nutritional Health in Schools, which made it clear that a sound risk prevention and control system of food safety in schools should be established to ensure food safety, and required schools to set up a meal accompaniment system and ensure information disclosure and transparency. It also requires schools to establish a meal system and ensure information disclosure and transparency, but the relevant provisions are too principled, and there are no detailed rules and supporting norms, so the performance of the affairs is poor. The absence of mandatory nutritional indicators is an important reason for the phenomenon of irrational combinations of school lunches and the lack of improvement in the nutritional quality of lunches [22]. Therefore, in the absence of a reasonable system to monitor the food entering the school campus, it is inevitable that low-quality prepared dishes will enter the school campus. When prepared food involves the extremely sensitive health issue of students' meals, the social group represented by parents will be extremely sensitive to whether their food safety can be guaranteed (Figure 6), and will be strongly opposed to it until there are accurate results.

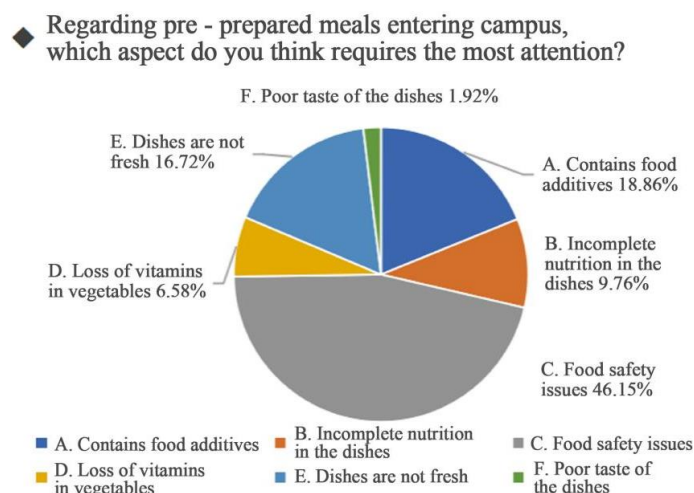


Figure 6. Statistical Chart of Prefabricated Vegetables in Schools Worry Factors

### 3.2 The Prefabricated Vegetable Trade Association is not Yet in Shape

Another important reason for the mixed quality of the prepared vegetable market is the absence of industry self-regulation, which is mainly reflected in the failure of trade associations to play a real role. China's Food Safety Law stipulates that "food industry associations should strengthen industry self-regulation" (Article 9, paragraph 1, of the Food Safety Law of the People's Republic of China provides that food industry associations should strengthen industry self-discipline, establish and improve industry norms and reward and punishment mechanisms in accordance with their statutes, provide food safety information, technology and other services, guide and supervise food producers and operators to operate in accordance with the law, promote the construction of integrity in the industry, and publicise and popularise food safety knowledge.), industry self-regulation is to achieve the common interests of the industry for the purpose of the main body of the market in some form of organisation to carry out the service, self-regulation, coordination and supervision of the functions of the economic organisation [23]. Due to more frequent and effective communication among members, industry associations have more comprehensive information advantages than government departments [24] and more professional technical advantages [25], and their standards, regulations and disciplinary measures are more enforceable, which contributes to a sound market system and market operation mechanism.

In response to the urgent demand for the development of the prepared vegetable industry, during the period of 2022-2023, Hebei Baoding Central Kitchen Prepared Vegetable Industry Union [26], China Prepared Vegetable Union [27], Liaoning Prepared Vegetable Industry Association [28], Shandong Prepared Vegetable Industry Federation [29], Luoyang Prepared Vegetable Industry Union [30], Zhongshan Prepared Vegetable Industry Union [31], and Changchun Prepared Vegetable Industry Union [32] were established one after another, but due to the relatively short time of establishment, most of the industry unions have not yet introduced prepared vegetable-related group standards to guide the development of the prepared vegetable industry (Among the 148 group standards for prepared vegetables embodied in Table 3, there are only two group standards formulated by the Prepared Vegetable Industry Alliance, with the main body being the Shandong Prepared Vegetable Industry Alliance).

Good internal governance structure is the structural requirement for the effective implementation of industry self-regulation, but few associations have organised specialised self-regulation departments or internal mandatory statutes in the prefabricated vegetable industry alliance set up in our country at present, thus unable to form an effective relief [33], and unable to reach the condition of "anti-self-interest policies and procedures for adequate internal protection" required by a good self-regulation system." [34] The absence of an internal self-regulatory system has in fact become a practical impediment to self-regulation by trade associations [35].

To sum up, it is difficult for the Prepared Vegetable Industry Alliance currently established in China to fulfil the role of self-governance as stipulated in the Food Safety Law in the areas of industry standardisation, food safety risk assessment, review of food safety standards, and reporting of problems, etc. (Article 9, paragraph 1, of the Food Safety Law of the People's Republic of China: Food industry associations should strengthen industry self-discipline, establish and improve industry norms and reward and punishment mechanisms in accordance with their statutes, provide food safety information, technology and other services, guide and supervise food producers and operators in accordance with the law, promote the integrity of the industry, and publicise and popularise knowledge of food safety. Article 23: The food safety supervision and management departments of the people's governments at or above the county level and other relevant departments, the Expert Committee on Food Safety Risk Assessment and its technical bodies shall, in accordance with the principles of science, objectivity, timeliness and openness, organise the exchange and communication of food safety risk assessment information and food safety information with the food production and operation operators, food inspection bodies, certification bodies, food industry associations, consumer associations and the news media. Supervision and management information exchange and communication. Article 28: National standards for food safety shall be formulated on the basis of the results of food safety risk assessments and with due regard to the results of risk assessments of the safety of food and agricultural products, with reference to relevant international standards and the results of international food safety risk assessments, and the draft national standards for food safety shall be made public, and the views of food producers and operators, consumers, and the relevant authorities shall be widely heard.), and in the absence of industry guidance and supervision, there is a real possibility that enterprises may over-emphasise economic benefits to the exclusion of their social responsibilities [36], which may lead to hidden dangers in food safety.

### *3.3 Limitations of ex Post Facto Accountability*

Currently China's food safety supervision is still more focused on the aftermath of the pursuit of responsibility, its lag can only play a deterrent role rather than preventive effect, and the lack of deterrence will lead to some enterprises to take chances, the safety of prepared dishes occur from time to time, again challenging the degree of social trust, and then affect the development of the industry.

#### *3.3.1 Poor Relief*

China's Food Safety Law sets out in some detail the ex post facto responsibilities that should be borne by food producers and operators, such as the responsibility to recall and the liability to pay compensation. Food recall system refers to the government to take coercive measures or the enterprise independent of the existence of food safety risk of defective food recall and compensation system, food recall is to improve the quality of food is one of the important measures, but China's food recall system there are imperfect regulatory system, departmental supervision responsibilities are not clear and other problems, so the government to take the food recall measures the effectiveness of food recall measures often did not meet the expectations of the regulatory authorities [37]. Recall by enterprises can assume social responsibility, but usually need to bear higher costs, small and medium-sized enterprises for practical considerations and brokerage rationality will often choose to avoid the responsibility to bear. Therefore, the recall system has not achieved the expected effect.

#### *3.3.2 Insufficient Deterrence of Penalties*

China's current food compensation liability for "pay ten times the price or loss of three times the compensation; increase the amount of compensation is less than one thousand yuan, for one thousand yuan" (Article 148, paragraph 2, of the Food Safety Law of the People's Republic of China: If a producer produces food that does not conform to food safety standards or operates food that he or she knows does not conform to food safety standards, the consumer may, in addition to claiming compensation for losses, demand from the producer or operator payment of compensation in the amount of ten times the price or three times the loss; if the amount of the increased compensation is less than one thousand yuan, it shall be one thousand yuan. However, the labelling and instructions of the foodstuffs shall be exempted if there are defects that do not affect the safety of the foodstuffs and do not mislead the consumers.) , but because most of the food unit price is not high, the total amount of compensation for the total price is not high, compared to the enterprise profit is too low, can not play a deterrent effect. And in practice, it takes a lot of time and cost but can not get effective feedback [38], consumers out of rational



consideration will give up claiming "ten times compensation". As a result, the system has become a tool for professional counterfeiters, reducing the willingness of enterprises to compensate [39].

In summary, the current ex post and ex post remedies have certain limitations in terms of regulation, making it difficult to achieve the policy objectives, and local governments may relax the supervision of enterprises bearing policy burdens due to regulatory capture [40] and food safety is not conducive to the provision of a favourable market environment for consumers.

### 3.4 Consumers' Right to Know Hampered

The Consumer Survey Report on Prepared Dishes published by the Consumer Protection Commission of Jiangsu Province 2022 shows that nearly 30% of consumers are concerned about the food safety of prepared dishes [41]. These concerns are not unfounded, but are due to the public's lack of understanding of the production process and product information about prepared dishes. The China Consumers' Association points out that "the lack of detailed labelling of pre-prepared dishes and the lack of notification of the use of pre-prepared dishes in takeaways and dine-ins have undermined consumers' right to know and right to choose." [42] And according to this questionnaire, only 17.49% of consumers reflected that merchants informed consumers when they used prepared dishes (Figure 7), more than half of respondents reflected that merchants were not informed when they used prepared dishes (Figure 8), and 78.79% of respondents believed that the behaviour of "merchants not informing" violated their right to information (Figure 8). their right to know (Figure 9)

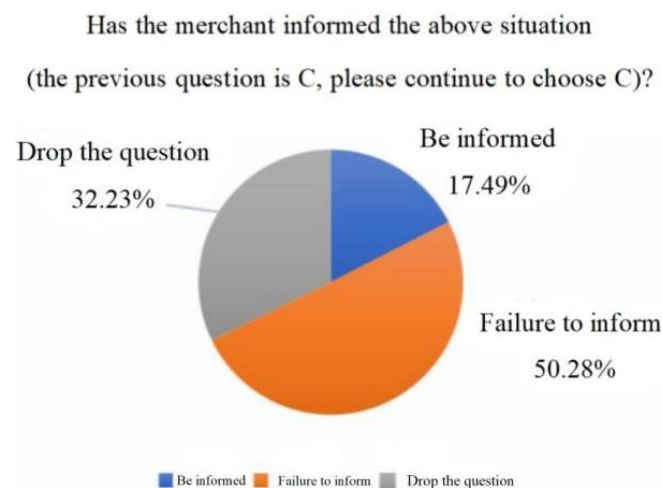


Figure 7. Merchant Notification Statistics

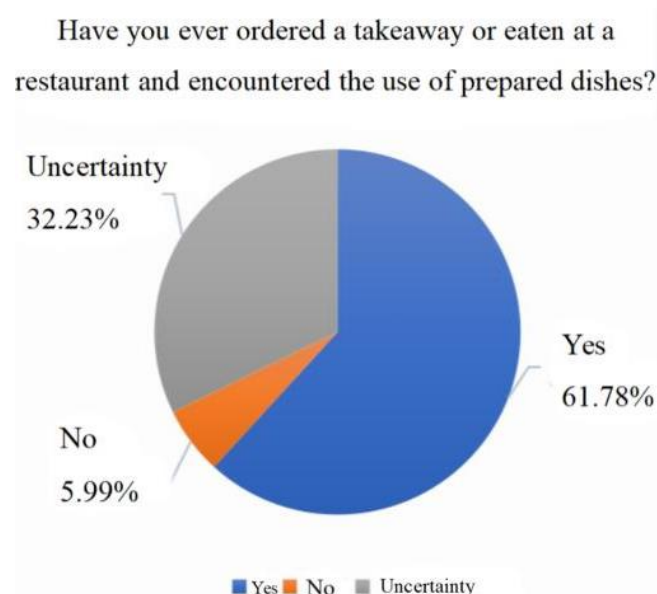


Figure 8. Merchant Prepared Dishes Usage Statistics

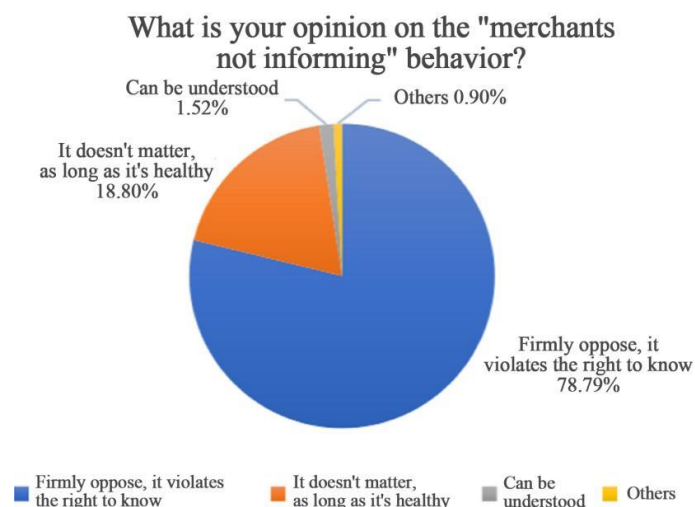


Figure 9. Respondents' Views on "Non-Information" Behaviours

The inadequacy of our information disclosure rules infringes on the public's right to know, raises the cost of testing for the public, and in fact reduces the public's trust in official sources of information. In fact, it is difficult for consumers at the demand side to understand the production process and production standards at the supply side. Currently, China's product information disclosure rules are not yet perfect, and there is no mandatory disclosure requirement for information on the production process, which is of greater concern to consumers. Therefore, the public needs to pay a very high verification cost for food information, and because people "trust negative information more than positive information" when facing health issues [43], when facing public opinion on food safety, the public tends to question the authenticity of official information. During this survey, 67.22% of the respondents preferred to trust the media, friends and relatives and other "unofficial carriers", while 6.96% of the respondents indicated that they "do not trust any information carriers" (Figure 10). Some surveys also indicate that there are no information carriers in China that most consumers can trust [44].

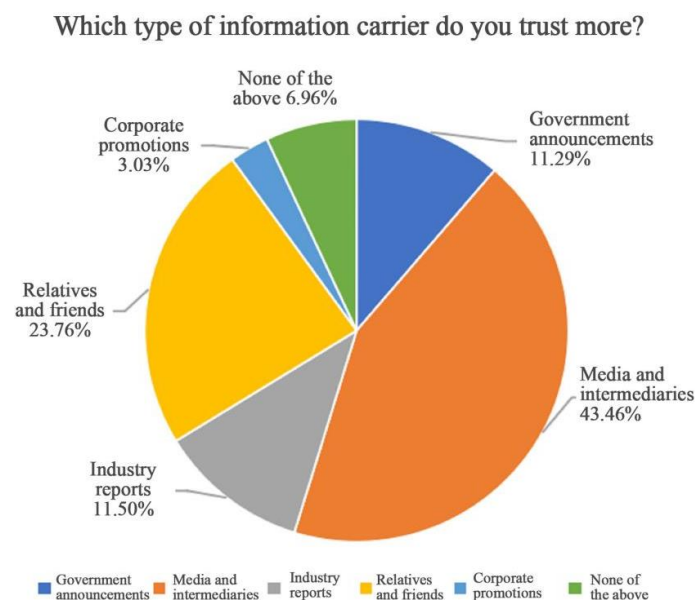


Figure 10. Statistical chart of respondents' trust in information carriers

To sum up, under the premise that the standard cannot provide basic protection, the industry cannot regulate itself, the deterrent strength of government regulation is insufficient, and a good market environment cannot be provided, and consumers do not have reliable information to trust, personal experience is more likely to become the most

reliable way of information screening, and low-quality prepared vegetables into the campus caused students to feel sick, and the restaurant uses prepared vegetables but "hides" the behaviour of the public for the food safety concerns of the prepared vegetable industry has become a trigger for negative emotions. Low-quality prepared vegetables entering the campus caused students' discomfort, and restaurants used prepared vegetables but "hid" their use, which became a trigger for negative emotions and magnified the public's concern about the food safety of the prepared vegetable industry.

#### **4. Exploration of the Solution Path to the Development Dilemma of the Prefabricated Vegetable Industry**

In response to the incident of prepared vegetables in schools, the Ministry of Education pointed out that "at present, there is no unified standard system, certification system, traceability system and other effective regulatory mechanisms for prepared vegetables" [45], in fact, is also the dilemma of the development of the prepared vegetable industry, the following is intended to be from the legislative level, the level of industry self-regulation, the level of government regulation and social supervision level. The following is intended to comprehensively analyse the solution path to the development dilemma of the prepared vegetable industry.

##### *4.1 Providing Regulatory Protection for the Prepared Vegetable Industry*

##### *4.1.1 Need to Develop a Series of Standards for the Production of Prepared Vegetables as soon as Possible*

China's prepared vegetable industry has been strongly supported by many official policies [1] [7], and the overall industry has shown a high-speed development trend, which has led to the current standardisation of China's standardisation work relatively lagging behind the rapid development of the prepared vegetable industry [46]. At the same time, it must be admitted that the diversity of our food culture makes it more difficult to standardise the production process of the prepared food industry in China than in the US and Japan [8].

However, only by formulating a series of standards for the prepared vegetable industry and regulating the quality standards in the field of prepared vegetables can we avoid a mixed market due to the industrial standards being in a vacuum [47] and thus provide the public with a market environment that can be fully trusted. The state should strengthen the research on the industry standard of prepared vegetables, clarify the concept of the subdivision of prepared vegetables, and expeditiously introduce the mandatory national standards that are closely linked with the market and urgently needed by enterprises, and build a perfect quality and safety system to clarify the basic bottom line of the production of prepared vegetables; and introduce the supporting recommended national standards or industry standards to guide the enterprises in scientific management of their business, and provide guidelines for the healthy development of the industry.

##### *4.1.2 Improving School Lunch Meal Standards*

Improving school lunch standards is a prerequisite for the rule of law for the entry of prepared dishes into schools. In view of the fact that the business model of some sub-categories of prepared dishes is consistent with the characteristics of the high demand for meals in primary and secondary schools in China, and is conducive to reducing the pressure on the independent preparation of meals on campuses, the sub-category should be supported to enter the campus under the condition of meeting the safety and nutritional value of meals. The implementation rate of Japan's school lunch programme is as high as 99% [48], which not only improves the nutritional intake of Japanese students [49] [50], but also restricts the intake of unhealthy food [22], improves the quality of student diets, reduces the risk of obesity, and makes the overweight and obesity rate of Japanese children stay at a low level in the world [51]. Its school lunch system has strong reference value for our country. Japan has passed a series of bills and policies to support the school lunch programme [52], and the revision of its School Feeding Law not only updates the nutritional and hygiene standards of school meals [22], but also ensures that the meals delivered by the central kitchens are in line with the dietary standards through the deployment of professional nutrition teachers [53]. And the effectiveness of the U.S. school lunch policy has also been proven. The U.S. National School Lunch Program uses the Healthy, Hunger-Free Kids Act (hereinafter referred to as HHFKA) and its implementing regulations as a legal guarantee [54] and improves with the revision of the U.S. Dietary Guidelines [52], and after the implementation of the HHFKA, the healthiness index of the students' meals has increased from 58% to 82% [55], and the quality of the school meals has been significantly improved.

From the implementation of school lunch in the United States and Japan, a good school lunch programme can optimise the nutritional intake of students, enhance their physical and intellectual fitness [56], and safeguard their healthy growth. The incorporation of school feeding into the legal system is an important measure to ensure the stable development of the lunch programme. China has promulgated the "Dietary Guidelines for School-Age Children", but the guidelines do not have the force of law, and there are certain difficulties in implementation and supervision. Therefore, based on the nutritional requirements for school-age children's meals stipulated in the

Guidelines, China can formulate standards for school lunch meals and, taking into account the current situation of our society, specify the hardware conditions such as raw material standards, quality standards, nutritional standards, geographical locations of enterprises and hygienic standards, etc., of the catering services provided to schools. In this way, we can strictly screen the prepared food enterprises that enter schools to ensure the safety and nutritional value of school lunches, and avoid the poor implementation of the school lunch system due to the lack of regulations, which in turn raises parents' concerns and questions about the safety and nutritional value of school lunches.

#### *4.2 Strengthening Industry Self-Regulation in Accordance with the Law*

The irreplaceable comparative advantage of industry associations in making up for the deficiencies of the government and the market has become the consensus of the current academic community [57] [58] [59], which should expeditiously allow the Prepared Vegetable Industry Association to play the role of industry self-regulation and to guide the development of the Prepared Vegetable Industry.

##### *4.2.1 Improvement of Industry Self-Regulation is an Important Force for the Development of the Prefabricated Vegetable Industry*

Industry self-regulation is a model of social responsibility bearing centred on consumer welfare [60]. Firstly, industry associations provide technical guarantee for industry development. Industry associations formed by enterprises in this field know more about the current situation of the industry and the application technology of the industry, so the industrial group standards issued by them are more in line with the direction of industrial development, which helps enterprises improve the technical standards and the certification system, and provides a solid foundation for the prosperous development of the industry. Secondly, industry associations are more capable of solving industry problems. Compared with other supervisory bodies, industry associations are more likely to find problems in enterprises and are more capable of proposing implementable solutions, which is conducive to saving government resources. Finally, industry self-regulation can help avoid the "spillover effect" of social supervision. Appropriate enhancement of industry self-regulation can help relax consumers' demand for verifiability of information, thus avoiding consumers questioning the objectivity of information due to the high cost of verifying information [61], minimising irrationality in consumers' decision-making, and preventing consumers from expanding their "distrust" of the companies involved to an undifferentiated boycott of the whole industry. The industry is still in the development stage of prefabrication. Therefore, it is urgent for the national prefabricated vegetable industry alliance to introduce perfect industry standards and internal governance measures as soon as possible, and to play the role of a "leading sheep".

##### *4.2.2 Industry Associations Need to Return to Their Expected Role in Society*

The lack of clarity in the boundaries of governmental power has led to the current excessive pursuit of "official recognition" by China's food industry associations. The attitude of the administrative authorities is one of the key variables determining the response of China's food industry associations, and is even more influential on their behaviour than media attention [62]. This pursuit of "official recognition" makes the industry associations give up the independence and democracy in the operation process to a certain extent, and they can't really play the role of industry self-regulation [63] and realise the social co-governance. However, the public's perception of food industry associations comes from the exposure of food safety time, and their expectation of food industry associations is more "food safety public interest defender" [36]. As a consumer interests as the core of the prepared food industry associations should pay attention to change the role positioning, more in line with the role of the public expectations, timely response to the public's questioning, and in the necessary time to investigate and sanction the companies involved, to provide the necessary safety information. This will require not only clarifying the boundaries of the government's power, and setting up appropriate legal responsibilities for improper and illegal interventions, as well as a complete accountability process to prevent the association from becoming "quasi-administrative" again, but also requiring the association to develop clear and specific guidelines and norms, as well as regular training and education, as well as acceptance of the association's social responsibility by the government, consumers, or public health advocates, There is also a need for trade associations to be subject to social scrutiny from government, consumers or public health advocates to prevent uncontrolled self-regulation[36].

#### *4.3 Strengthening Risk Prevention and Regulation of the Prepared Vegetable Industry*

Government regulation in accordance with the law is a necessary way to promote food enterprises to assume responsibility for food safety and the bottom line guarantee [64]. China's food safety regulation is still based on ex post facto tracking [65], and this model is difficult to respond to the requirement of ex ante prevention of modern food risks such as prepared dishes, where consumers care more about the attribute of trust [66], so China needs to improve the law enforcement regulations of risk prevention in the prepared dish industry.

#### 4.3.1 Existing Mechanisms Cannot be Effectively Utilised

Risk analysis and assessment (RAA) is one of the most internationally recognised forms of preventive food safety control [68] [69] [70] [71]. It has been shown that the implementation of Hazard Analysis and Critical Control Point (hereinafter referred to as HACCP) system has been urgent in the field of food safety, and the plan can ensure food quality and safety more economically [72]. Article 17 of China's Food Safety Law clearly stipulates that China applies risk assessment regulatory methods in the food sector. The new version of the Hazard Analysis and Critical Control Point (HACCP) System Certification Implementation Rules released by the CNCA in 2021 extends the scope of HACCP mechanism certification to storage, logistics and trade, which are important links in the supply chain [73], but the real role of HACCP needs to ensure the credibility of the data. And the encryption of blockchain prevents the possibility of data falsification [74], blockchain technology should be applied to the HACCP system in the prepared vegetable industry in order to avoid missing the best time for early warning due to data tampering.

#### 4.3.2 Improvement of the Mechanism of the Traceability System to Assist in the Determination of Legal Responsibility

Risk ex ante prevention requires not only a correct assessment of risk, but also a sound traceability data system to ensure attribution of responsibility. However, China's overall performance in the assessment of traceability regulations is poor [75]. The epidemic has led to a generalised trend in the application of traceability systems in China [76]. And due to the large number of systems and inconsistent requirements, the duplication of reporting, testing, and code assignment work in fact lengthens the process of product circulation and aggravates the operating costs of enterprises [77]. The mode of segmented supervision will also lead to "no one cares" or "rush to care" in the final pursuit of responsibility, which reduces the performance and use value of the traceability system [78]. Therefore, on the basis of China's existing food traceability platform, the state for the current platform for upgrading, unified traceability system needs to be registered in the production, transport, storage of relevant information, and will be around the system and the national food traceability platform link to ensure the traceability of food responsibility is more feasible.

Applying blockchain technology to food traceability systems. Traceability, often defined as the ease with which a product can be traced throughout the supply chain, is extremely dependent on reliable information [75]. Currently used centralised systems also suffer from the same flaws of information forgery [79], and are unable to achieve the collection of traceability information in a trustless environment to ensure information security and reliable traceability. Therefore, it is inevitable that it cannot establish an effective trust mechanism between the stakeholders of the prepared vegetable industry who need quality traceability [80]. Therefore, the traceability system of the prepared vegetable industry also needs the effective application of blockchain technology, using the tamper-proof nature of blockchain to improve the transparency and traceability of information acquisition<sup>[75] [80]</sup>, reduce human intervention, not only provide a mechanism of trust for industry stakeholders, but also facilitate the government's responsibility determination.

#### 4.3.3 Improvement of the Country's Rapid Early Warning Mechanism to Prevent the Spread of Risks

Risk assessment is to determine whether there is an ex ante risk, while traceability mechanisms are for timely accountability after an ex ante risk has been identified, but neither of them conveys information about the risk and draws the attention of the local government, members of the industry, and the community at large.

A food safety alert is an advance warning of a possible threat to human health in a food product or of the impact of a major decision on a country or a company [81]. The EU has constructed a relatively perfect EU rapid early warning system for food and feed, which can help member states to collect and exchange information [68], prevent the spread of risky food in member states, and guarantee the food safety within the EU. China can refer to the EU's related mechanisms to improve our rapid early warning mechanism related regulations, such as coverage, warning frequency and classification, according to different levels of prepared vegetables risk to take response mode, in saving government resources at the same time, to prevent the proliferation of prepared vegetables safety events.

#### 4.4 Improving Information Disclosure

The food safety incident of China's prepared vegetables in schools revealed that the public's high sensitivity to negative news about the prepared vegetable industry stems from the opacity of the relevant information, and even more so from the lack of information disclosure rules. The reduced level of trust will also inhibit the effectiveness of government regulation [82]. Therefore, there is an urgent need to broaden the sources of reliable information.

Only through the improvement of information disclosure rules to rebuild consumer trust in information, social supervision can operate effectively. In the measures to solve food safety problems, the importance of social

supervision is often mentioned, and the government is required to further disclose information to ensure the smooth flow of information and to mobilise the enthusiasm and initiative of social participation [83], but it is neglected that the prerequisite for the effective operation of social supervision is a high degree of accuracy of information related to the whole industry [61], and in the absence of perfect rules for the disclosure of information, consumer confidence can partly be rebuilt by providing more information related to food quality or safety to the consumers. information related to food quality or safety to partially rebuild consumer confidence. In Japan, QR codes and other methods are used to disclose all traceability information of food products to the public, and in an interview in Japan, 20% of the respondents regarded the existence of food traceability information as a sign of ensuring food safety [84], which demonstrates that traceability systems not only have the attribute of information provision, but also have a strong attribute of trust among consumers. The EU's strict product disclosure rules also reduce the public's cost of information confirmation and raise the level of participation in social supervision [85]. Referring to the experience of Japan and the EU, it can be seen that effective disclosure of product information can actually increase the level of public trust. 58.2% of the respondents also supported this view (Figure 11), so it is urgent for China to refer to the EU to formulate clear product disclosure rules, but for the time being, by opening up the food traceability system based on blockchain technology to the public, it can in fact be used as a kind of quality assurance signal to help the public to build trust in products and reduce the scope of negative public opinion.

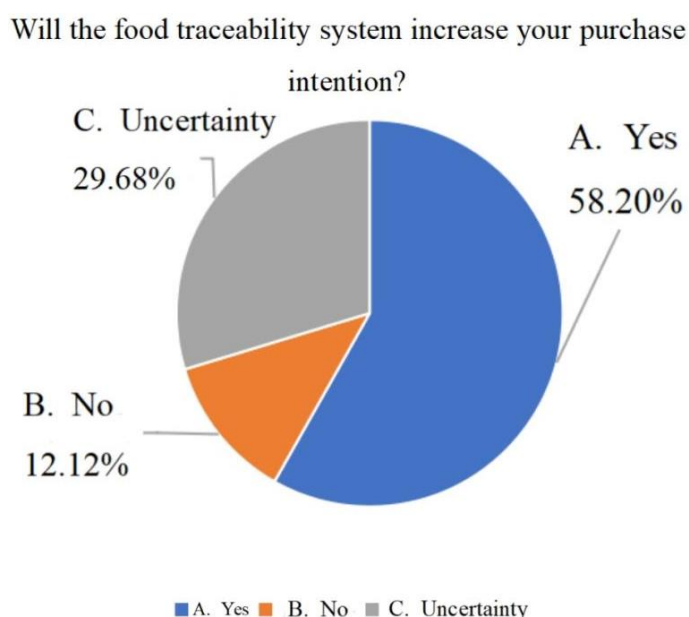


Figure 11. Statistical graph of the impact of food traceability system on respondents' willingness to buy

Guaranteeing the independence of social supervision helps to improve the strength of government regulation. The healthy development of prefabricated dishes requires full utilisation of the independence of social supervision. Although the lowering of the level of trust will inhibit the effectiveness of government regulation, social supervision will not result in regulatory capture due to policy considerations[40] Good social supervision can not only give high-quality positive feedback to enterprises, but also compel the government to increase the intensity of punishment, which will help to realise the legislative purpose of "social co-regulation". This will help to realise the purpose of the legislation on "social co-rule".

In summary, to ensure the long-term healthy development of the prepared vegetable industry is a complex project that requires the joint efforts of many parties. It is not only necessary to formulate unified national standards for prepared vegetables and industry standards in terms of legislation, as well as to improve the relevant regulations on school lunch to regulate the development of the prepared vegetable industry; it is also necessary for the industry to establish a national industry association with accurate role positioning as soon as possible to lead the industry's high-quality development. Not only does the government need to further improve the existing laws and regulations on the basis of the use of blockchain technology to improve the HACCP system, food traceability system and early warning mechanism to respond to the risk of the prepared food industry prior to the prevention of the requirements; but also need to comply with the rules and regulations to the public to open the food traceability system in order



to rebuild the confidence of consumers in the industry, so as to better play a role in the social supervision, to achieve the social co-management.

## 5. Concluding Remarks

With the epidemic as well as the lazy economy, the prepared vegetable industry has ushered in a blowout period of rapid development. However, the lack of standards and legal regulations, the actual absence of industry associations, the industry's overemphasis on risk prevention, and the lack of transparency of food information have made it difficult for the public to place sufficient trust in the prepared vegetable industry. Therefore, the prepared vegetable industry is more likely to cause negative public opinion. Taking into account China's specific national conditions, this paper argues that the sustainable development of the prepared food industry needs to rely on the joint efforts of the state to improve legislation, industry associations to correctly guide the industry, the government to change the regulatory model, and to rebuild consumer confidence.

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