



# Analysis of the Current Situation and Countermeasures for the Development of Shandong Rongcheng Kelp Industry Cluster

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**Abstract:** Rongcheng is a natural kelp production base due to its unique geographical environment and climatic advantages. Since the 1930s, the Rongcheng kelp industry has played an important role in the development of the Chinese kelp industry. Rongcheng's kelp output ranked first in China for more than ten years, from 2010 to 2021. Its kelp production accounts for nearly half of total Chinese kelp production. This paper analyzes the current development of the Rongcheng kelp industry cluster from six perspectives: natural environment and resources of kelp farming, supporting infrastructure of kelp farming and processing enterprises, main bodies in Rongcheng kelp industry cluster, relevant assistance of Rongcheng municipal government to kelp industry, development of relevant supporting industries in kelp industry. Then it concludes that there are four problems in the current development stage of Rongcheng kelp industry cluster and the development of Rongcheng kelp industry cluster's domestic and foreign markets. It then concludes that there are four issues in the current development stage of the Rongcheng kelp industry cluster. Based on the analysis of the problems and countermeasures, it is concluded that the current development stage of the Rongcheng kelp industry cluster has four problems: low cluster efficiency, an imperfect market system, a lack of technological innovation, and a weak influence of regional brands. It assists the Rongcheng kelp industry cluster in achieving high-quality development based on an analysis of the problems and countermeasures.

**Keywords:** Rongcheng kelp industry, Rongcheng kelp, industrial clusters, sustainable development

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## 1. Rongcheng kelp industry cluster development environment

Rongcheng is situated in Bohai Bay and is surrounded by water on three sides. Through the vigorous development of provincial and municipal governments and the unique natural resource advantages of Rongcheng, the kelp industry cluster in Rongcheng has formed a relatively complete industrial structure, including kelp seedling breeding, kelp raw material breeding, food processing, kelp raw material production, and so on. By 2021, Rongcheng's kelp output will be 527,400 tons, accounting for nearly 40% of China's total kelp farming output [1]. There are 278 kelp farming production and processing enterprises, and the kelp industry's annual main business income will be 5.883 billion yuan. Rongcheng kelp industry focused on developing its distinctive industries, resulting in a complete kelp industry chain and a wide range of kelp products. Including nearly 300 different types of products in food, medicine and health care, chemical manufacturing, and other areas. It has established China's largest scientific and technological research and development base, kelp logistics distribution center, and kelp import and export trade center. Rongcheng currently has 43,000 base farmers and nearly 90,000 people involved in kelp farming. When we look at the development history of the Rongcheng seaweed industry, we can see that it has formed a veritable "agricultural cluster." Rongcheng's seaweed industry has grown into a representative agricultural industry cluster in China, which is critical for Rongcheng's overall agricultural competitiveness and regional economic development.

### 1.1 Basic conditions of Rongcheng seaweed industry cluster

#### 1.1.1 Natural resources

Rongcheng is located at the easternmost tip of the Jiaodong Peninsula, surrounded by sea on three sides, with a 500-kilometer coastline facing the Yellow Sea and surrounded by land on the north, west, and south sides. The total area of the sea surface for fishery is 182,891.74 hectares, occupying a total length of 196.29 kilometers, including seven open aquaculture areas, namely, the coastal aquaculture area in Rongcheng on the north side of Chengshantou aquaculture area, the agricultural and fishery area in Rongcheng Bay, and the coastal aquaculture area in Rongcheng South of Sanggouwan-Caodao agricultural and fishery area, with There are four artificial reef zones totaling 111,900 hectares [2], including Rongcheng Jiming Island-Xiakoutan Fishery Culture Zone, Rongcheng Bay Artificial Reef Zone, Sanggou Bay Artificial Reef Zone, and Zhukou Artificial Reef Zone (Table1).

**Table 1. Sea use planning in Rongcheng City in 2020**

Primary class name	Secondary class name	Planning area	Area (ha)	Shoreline (km)
Fishery use of the sea	Open sea for aquaculture	7	144180.32	159.8
	Artificial reef sea use	4	1975.94	0
	Species Resource Protection Zone	2	1297.48	0
Other sea use	Reserved Sea Area	4	155021.64	38.49

With an annual rainfall of 819.6 mm, with the maximum in August of the entire year, the Rongcheng area is rich in rainfall, with significant changes in the four seasons. The terrain is excellent, the seafloor is flat, original productivity is high, and water quality is excellent. The bay's average water depth is 7.5 meters, which is affected by the tide and results in an irregular semidiurnal tide. The salinity range of seawater in the Rongcheng sea area is 29-32, and the sea area contains many organic salts with gentle fluctuations. The annual average sea water temperature is 12°C, with monthly average minimum and maximum water temperatures of 1.8°C and 23°C in February and August, respectively. The solar radiation intensity is 75w/2-313w/m<sup>2</sup>, and the average sunshine duration is 12h, though this varies significantly depending on the season. Offshore waters have water quality standards that meet or exceed the national class 2 standard. Table 2 shows that the natural sea conditions for aquaculture in Rongcheng are in high agreement with the best conditions required for kelp growth, and Rongcheng's unique natural environment advantages lay a solid foundation for the development of a kelp industrial cluster in Rongcheng.

**Table 2. Comparison between kelp suitability index and local index of Rongcheng**

Culture species	Indicators	Suitable range	Rongcheng value
Kelp	Temperature	5-15c	12
	Flow rate	50	37-59
	Inorganic Nitrogen	0.15-0.25	0.13-0.24
	Salinity	29-‰	29-32‰
	Intensity of care	350	259

### 1.1.2 Infrastructure situation

The related infrastructure construction around the kelp industry cluster in Rongcheng is becoming more and more perfect as the kelp industry cluster develops. Rongwu G18 and Rongwei S16 expressways connect Shandong, Hebei, Tianjin, Shanxi, and Inner Mongolia in terms of transportation. Shidao and Longyan Wharf cargo throughput reached 5.684 million tons in 2021, and container throughput was 280403TEU;; The three-dimensional channel network of land-sea transport has largely taken shape.

Rongcheng Lidao Kelp Industrial Park is a National Development and Reform Commission-approved national development zone. It has been built into "Lidao-the first kelp town in China," and has become a demonstration base for kelp processing in the entire province as well as a demonstration base for the national "863" key project. Forty-two aquatic products processing and related enterprises have been introduced into town, and the projects that have been invested in include kelp health care and health care products, agricultural organic biological feed, kelp biological extraction, and "863" domestic and foreign cooperative development, covering primary, intermediate, profound, all-level, and multi-fields. Build a 1,000-hectare compound comprehensive breeding experimental area, a 150-hectare kelp mechanized production and processing industrial park, 15 cement touch reefs and 3 offshore platforms, divide the original Chengshan Hongyuan Port into two, transform it into a fishery production and sea-friendly experience wharf, and build a 1,000-hectare compound comprehensive breeding experimental area. Simultaneously, ecological protection projects such as shoreline restoration, proliferation, and release will be carried out, resulting in the establishment of 10 large-scale kelp breeding bases in Yandunjiao Aquatic Products, High Green Aquatic Products, and Lidao Seafood in the jurisdiction, the uniform adoption of 2.1 million ecological floats, and the comprehensive transformation of nearly 200 traditional basic processing production lines such as marinating and drying kelp at the provincial level. The town's kelp processing capacity can reach 300,000 tons, accounting for one-quarter of total domestic kelp processing. It is China's largest kelp processing and sales center.

## **1.2 The situation of kelp industry cluster participating subjects**

### **1.2.1 The situation of kelp farming farmers**

Kelp farming has a long history in Rongcheng. Farmers' enthusiasm for kelp farming has been piqued as a result of the formation and development of the kelp industry cluster, and farmers have begun to engage in kelp farming, while their income has also increased significantly. Simultaneously, with the formation of a large number of kelp farming cooperatives, Rongcheng has established a number of local business models, including "base-based leading enterprises" and "enterprise cooperatives+base farmers," which have promoted the standardization, scale, and intensive development of kelp farming. Cooperation among enterprises, professional economic cooperation organizations, and farmers has formed a good interest contact mechanism with the government's support and guidance. By 2021, the city will have 87 professional mariculture cooperatives, with 6 of them serving as provincial demonstration cooperatives. In the same year, Rongcheng's annual output value of kelp exceeded 500,000 tons, annual sales exceeded 5 billion yuan, and farmer kelp sales per capita reached 19,813.5 yuan.

### **1.2.2 The situation of kelp processing enterprises**

With the rapid development of industrial clusters, the division of labor among cluster enterprises is becoming increasingly clear, and product types are diversifying. The rapid development of clusters has greatly alleviated farmers' kelp sales problems, attracting more farmers to cultivate kelp and promoting the development of local kelp industrial clusters. Furthermore, the development of the Rongcheng kelp industry cluster drives the gathering of industries and institutions such as agricultural product packaging, logistics, and technology promotion. By 2021, Rongcheng will have more than 70 kelp-related processing enterprises, including 5 enterprises with a capital of 100 million yuan, more than 30 regulated enterprises, and more than 50,000 kelp-related employees. Shandong Province has four national well-known trademark enterprises, more than 15 brand enterprises, and three national agricultural and sideline product processing enterprises. In the city, there are 26 key leading agricultural industrialization enterprises at all levels. There are three on the national level (Xunshan Group, Haodangjia, and Xinfa) and nine on the provincial level.

### **1.2.3 Related support industries**

In terms of breeding and technological innovation, Shandong Province launched a breeding project to support kelp germplasm innovation in 2005. Kelp was also named a key development variety in the marine breeding project in 2010. Cooperate with Rongcheng Ocean University of China, the Institute of Oceanography of the Chinese Academy of Sciences, and more than ten local universities and scientific research units in the province to explore and improve breeding and breeding methods; kelp breeding and breeding technology is leading in China due to innovation in breeding and breeding technology. Among them, the new kelp variety "Ailun Bay," which was developed in collaboration with Ocean University of China, is a well-known compound kelp variety in China, with a yield increase of more than 25% per mu when compared to traditional varieties. It has now been extended to the entire country, promoting the healthy development of the kelp industry throughout the country. Kelp processing technology, including primary processing, finishing, and deep processing, has emerged in recent years, progressing from rough processing to finishing. Rongcheng pioneered "algae chemical technology with fresh kelp as raw material," and has consistently conducted scientific research, employing advanced technologies such as enzymolysis, alcohol extraction, membrane separation, and concentration to extract shellfish polysaccharide, amino acids, natural food additives, flavoring agents, kelp fertilizer, and other products involving health products, condiments, kelp fertilizer, and other fields.

### **1.2.4 Government support**

Rongcheng City's pillar industry is kelp. The government has paid close attention to and supported it, collaborating with the local government, government, and government to create a pattern of government establishment, enterprise operation, and market operation that fully utilizes the regional brand of "Rongcheng Kelp." Enterprises can form a whole and orderly development through a series of measures such as rational planning of industrial strategy, scientific implementation of industrial layout, integration of superior resources, and strengthening of scientific and technological research and development. In addition to strong support for infrastructure construction, enterprises in the park have received soft policy support, such as project application, land acquisition, financing, and other aspects. At the same time, the Rongcheng municipal government is actively developing the kelp brand. The State Administration for Industry and Commerce certified Rongcheng as a geographical indication in 2005. Rongcheng was designated as the "National Kelp Processing Demonstration Base" in 2006. Rongcheng was named the "Kelp Capital of China" by the China Seaweed Industry Association in 2016. At the same time, it is critical to continue to promote and popularize the kelp industry. Rongcheng Municipal Government collaborated with more than 30 major online media and relevant media in the province to launch the "Sea Granary" Rongcheng Ocean Tour in 2015, which conducted in-depth research on the production and processing workshops, corporate culture, and product brands

of kelp enterprises such as Rongcheng Haibao, Lidao Aquatic Modern Technology, and Haodangjia Group, and publicized the Rongcheng kelp brand in an all-around way. Simultaneously, take full advantage of the online trading platform of China aquatic products e-commerce and the "kelp" exhibition of China aquatic products trade network, and actively guide more than 10 kelp enterprises to actively publicize, publicize, and sell Rongcheng products, in order to increase Rongcheng product popularity. Rongcheng Agricultural Bank vigorously develops green agriculture and kelp, and provides loans to assist kelp processing enterprises in increasing their export earnings. Kelp Company, according to its reputation, actively engages in credit, acceptance, international settlement, discount, and other businesses. In terms of loans, we should follow the "do it quickly" principle and actively accept, approve, and issue loans declared by enterprises. With the strong support of the Agricultural Bank of China, a large number of companies of varying sizes have sprouted up one after the other. There are 27 enterprises with import and export qualifications among them, and 14 enterprises have become kelp industry export earning groups.

### **1.3 External environment of the kelp industry cluster in Rongcheng City**

#### **1.3.1 Market demand of kelp products**

Kelp has been consumed and grown by humans for over a century because it is a nutrient-rich algae. In the last ten years, an increasing number of kelp products have entered people's diets and lives. Kelp product market demand is gradually increasing, with an average annual growth rate of more than 5%. Kelp contains dozens of effective active ingredients, and it has been recognized by medical authorities in preventing and treating goiter, resisting blood acid, resisting tumor, and promoting intellectual development. Furthermore, kelp and related products are widely used in agricultural feed, chemical fertilizer, chemical raw materials, and other fields, and a significant breakthrough in the chemical field has been made. Kelp has recently demonstrated exceptional performance in the medical health and industrial chemical industries. According to relevant statistics, the national kelp industry was 3.6 billion yuan in 2018, with hundreds of kelp food processing enterprises producing nearly 10 billion yuan annually. The kelp market in Japan and South Korea has shrunk due to rising labor costs and other factors, creating a better sales opportunity for Rongcheng kelp products to enter the international market. Several large enterprises, including Haodangjia, Haidaibao, Xunshan Group, and Lidao Kelp Technology Company, have reached 100 million yuan in kelp export volume, and Rongcheng Kelp has left an indelible mark in foreign markets.

#### **1.3.2 Innovation of kelp products and processing technology**

Rongcheng has actively introduced, tested, and popularized new kelp varieties and technologies in recent years, relying on the city's scientific and technological innovation team as well as the agricultural extension service system. The best varieties were chosen for iterative seedling improvement after a comparative test of dozens of varieties. Develop a variety of efficient kelp culture technologies, such as shellfish-algae polyculture technology, fish-crustacean-algae rotation culture mode, and so on, to realize the breakthrough and innovation of traditional kelp culture mode and increase natural resource carrying capacity. Simultaneously, food biotechnology and industrial production technology are being organically combined, allowing primary processing processes such as kelp dehydration and pickling to achieve factory and semi-automatic mechanized production. The research results of high-speed centrifugal extraction of kelp polysaccharide and unique amino acid components by Xunshan Group achieved a breakthrough in the physical field and filled a gap at home and abroad in the field of high-end manufacturing of kelp products. Haodangjia Group seeks to collaborate with traditional pickle enterprises such as Wujiang mustard tuber, and after innovation, transformation, and upgrading, applies traditional pickle fermentation technology to kelp processing, and kelp pickle has been successfully published. Lidao Kelp Technology Co., Ltd. is working hard to develop organic kelp bio-fertilizer, breaking through the original chemical extraction technology. The bio-extraction technology used is the most advanced bio-extraction technology available today. Various enzymes produced by microbial fermentation decompose kelp macromolecules into small molecules. This method has a mild reaction, uses safe and environmentally friendly products, and will not pollute the environment. It has improved the current situation in the kelp bio-organic fertilizer processing industry, which is characterized by high pollution, high energy consumption, and low benefit.

This paper comprehensively analyzes the internal and external environment of kelp industry cluster development in Rongcheng based on the three aspects of participants, basic conditions, and external conditions, and concludes that the foundation of kelp industry cluster development in Rongcheng is its resource endowment and location conditions. Farmers, kelp processing enterprises, Rongcheng municipal government, scientific research institutions, intermediary organizations, and other related and affiliated enterprises have formed the kelp industry cluster's power source. The external environmental background for the development of the kelp industry cluster is market demand and technological innovation capability.

## **2. Problems in the development of the kelp industry cluster in Rongcheng**

### **2.1 Cluster effect of kelp industry cannot be effectively played**

At the moment, kelp farming in Rongcheng City has reached a certain level of large-scale farming, but individual kelp farmers still occupy nearly half of the kelp farming business subjects, and the majority of the kelp raw materials produced by individual farmers enter the market directly, resulting in a strong sense of autonomy among individual farmers and a relatively weak sense of collaboration. When the year is bad and product sales are difficult, they are eager to get help from government agencies and businesses. However, when the year is going well, they resist attempts by the government and businesses to intervene. In terms of raw material supply channels, many companies in the Rongcheng kelp industry cluster rely more on many retail households for "order-based" harvesting, and this uncertainty in farmers' behavior is likely to cause farmers to break their contracts, increase distrust among cluster subjects, and increase transaction costs. This has a direct impact on a company's economic efficiency and weakens its market competitiveness. Because the upstream link of kelp production and processing does not necessitate a high level of scientific and technological content, the threshold of upstream enterprises in the industry chain is low, resulting in a large number of small enterprises with low-level, rough processing production piling up within the cluster and a strong homogenization of enterprises within the cluster. To seize a larger market share from competing enterprises, homogeneity and the same scale of enterprise internal consumption are critical, resulting in an industry-wide race. It has a significant impact on the overseas business expansion of Rongcheng kelp, and the overseas living space of Rongcheng kelp products is further squeezed. Rongcheng kelp export used to account for nearly 30% of China's total kelp export. However, due to the disorderly competition of foreign trade enterprises, the total kelp export share continues to rise while the product price continues to fall. Worse, Japan, South Korea, Europe, America, and other countries have all conducted kelp anti-dumping investigations against China, severely limiting Rongcheng's market space in China.

### **2.2 Market service system is not perfect**

The state's support for its policies in the development and expansion of the entire kelp industry cluster focuses primarily on the cultivation of "leading enterprises," while ignoring the survival and development of small and medium-sized private enterprises and the regulation of deep processing and kelp circulation. The kelp industry cluster in China lacks scientific planning and overall layout, and its system construction is relatively primitive. Due to the low entry threshold for enterprises, a large number of enterprises that have not engaged in the acquisition, storage, and processing of kelp blindly flood into the kelp market, which is highly volatile due to the dual risks of nature and the market. Since 2015, the volume of fresh kelp exported from China has fluctuated constantly. The import unit price is USD 4/kg and the export unit price is only USD 3.5/kg. Due to large losses, many small and micro kelp storage and processing companies went bankrupt in a short period of time. Because the government lacked an early warning and emergency plan, it was powerless to prevent the company's sudden bankruptcy. Middlemen and related industries do not have a close enough relationship, and intermediary service organizations do not play their full role, resulting in loose relationships among enterprises and asymmetric market information. This situation has a direct impact on the price of kelp, which in turn determines farmers' enthusiasm and stability. Kelp farmers have expanded their cultivation area of kelp in order to obtain a higher income in years when the price of kelp has improved, but the price of kelp has dropped slightly, so they have reduced their production. The amount of kelp grown by kelp farmers each year can only be determined by feelings and rumors. Black-box transactions, undisclosed information, and asymmetric information are some of the issues that exist between export processors and kelp storers. Stores are unable to obtain accurate price information and thus are unable to store within a reasonable price range. Kelp operators do not understand or pay attention to national and local government policies and guidelines, resulting in an incorrect prediction of their business behavior. The inefficient market service system will have a direct impact on the healthy and orderly development of the entire kelp industry.

### **2.3 Lack of technical innovation**

The main Rongcheng kelp products circulating in domestic and international trade are fresh kelp, dried kelp, and so on, and kelp processing technology is primarily concentrated in one-time processing products such as dried kelp, salted kelp, and so on. The technical means are insufficient, and the energy consumption of processing equipment is high, with a low technological content. However, deep processing research has not formed a system and has not been widely developed and applied, and the level of processing technology is low, as is the added value of products. The research and development of new technology and the innovation of manufacturing processes have a long project cycle, and the project's success is contingent, so the likelihood of enterprises carrying it out independently is low. Furthermore, a lack of technical innovation talent is a significant factor. The competition for raw materials and primary processed kelp products is fierce, and the rate of return is low. This series of technical issues will have a direct impact on the long-term development of the kelp industry.

### **3. Suggestions for the competitiveness of kelp industry cluster in Rongcheng City**

#### **3.1 Protect the breeding resources and further strengthen the cluster location advantage**

The Rongcheng kelp industry cluster capitalizes on the advantages of local kelp resources to gradually form a kelp industry cluster under government leadership. Kelp dominates the Rongcheng kelp industry. To develop a high-quality kelp industry, the cluster's location advantage is required. First and foremost, a kelp industry cluster park must be built in an area with convenient transportation, outstanding regional characteristics, perfect facilities, and an obvious clustering effect. According to a statistical analysis of relevant data in Rongcheng, Slangdao Town, Yatou Town, and Chengshan Town are the towns with concentrated kelp production in Rongcheng City, and are suitable for the development of kelp industry clusters and concentration parks. Second, because of its marine location, Weihai is home to many nationally renowned sea universities and comprehensive universities, as well as a large number of scientific research units of seaweed breeding and processing development in the city and surrounding areas, which creates favorable conditions for the close integration of production, education, and research of seaweed breeding production. The completion of the Rongcheng Free Trade Zone will significantly accelerate the development of infrastructure, transportation, and rural tourism. Rongcheng kelp industry should maximize its own advantages, form a cluster of location advantages, and promote kelp industry development.

#### **3.2 Development of leading enterprises of clusters**

Agricultural leading enterprises are responsible for expanding market economy, innovation, leading the majority of farmers to increase their income, and promoting local economic development as the cornerstone of rural market economy and an important bridge connecting traditional farmers and market economy. As a result, it is necessary to expand into the fields of kelp processing, industry marketing, and product after-sales service in order to establish large-scale enterprises with high economic efficiency and sustainable development, and thus develop the comprehensive resource advantages of rural industrial clusters [3].

Leading agricultural enterprises can improve rural communities' development capacity and farmers' returns while reducing market risks. To begin, it is necessary to educate and train the region's major private enterprises through a modern company system, as well as strengthen supervision, in order to promote learning and exchange among SMEs, enhance competition and cooperation among SMEs, promote SMEs' growth, promote the scale and quality of SMEs in rural areas, and improve the quantity and quality of SMEs. Handle the relationship with SMEs and leading enterprises correctly. Beginning with the benefit-sharing mechanism of leading enterprises, we fully utilize the flexibility of the enterprises themselves to provide service needs for the leading enterprises, greatly improving the company's economic benefits. By providing quality services to businesses, the overall economic benefits are increased, allowing the company to develop and grow. Furthermore, large corporations can outsource a portion of their operations to developing countries to improve their sense of division of labor and cooperation, thereby lowering their own production costs. Increased foreign investment and new external capital interventions can help local agro-industrial clusters develop. As a result, local governments must pay close attention to the strategy of attracting foreign investment and provide preferential policies and a relatively relaxed financing environment to private enterprises. Priority should be given to projects with significant innovation drive and the potential for a large pull effect when selecting foreign investment projects, and these projects should be actively guided. Efforts should be made to combine the introduced world-leading technology with the regional agglomeration's unique resource advantages, so that the comprehensive benefits of all aspects can be maximized, thereby improving the agglomeration's overall competitiveness.

#### **3.3 Improve the construction of market service system**

##### **3.3.1 Establish a sound information service system**

Kelp production, processing, packaging, sales, and numerous other links are all part of a complex system project. The ability of internal links to function normally and coherently is heavily reliant on the efficient flow of internal information. Because each link is relatively independent, and different types of information are complicated, a solid information service system must be established to communicate with each link in the kelp industry chain, and specialized intermediary services should be developed to serve the cluster's consultation system. Rongcheng kelp products discussed in the third chapter lack international cooperation experience and relevant import and export policies in the process of entering the international market, because contact information between local enterprises and overseas customers is relatively simple, and there is a significant information asymmetry contradiction. To address this issue, we must assist local enterprises in developing relevant export policies and market information, such as the market size of exporting countries, the price of kelp, and the technical barriers of importing countries, in order to assist enterprises in developing export strategies, reducing risks, and maximizing economic benefits.

### 3.3.2 Establish quality control system for agricultural products and strengthen the safety management of agricultural products

There have been a number of major food safety accidents in China in recent years, which have drawn the public's attention to food safety, and the public's demand for food safety is growing by the day. Because kelp is a popular food, we must ensure its safety during processing. The key to healthy and sustainable development is to ensure the quality of agricultural products, a strong quality management system, and strict institutional constraints. To strengthen oversight of kelp production sources, we should vigorously promote high-quality agricultural standard technology, standardized production, upgrading traditional production and breeding methods, encouraging export enterprises to establish their own breeding bases, establishing traceability systems, and implementing quality control throughout the process. Improve the management of the manufacturing process. Increase supervision and guidance of processing enterprises to ensure the safety and efficiency of product production and processing technology. Increase the surveillance of the circulation field. The introduction of kelp into various regions should consider not only the safety of kelp cultivation and production, but also the safety of organisms and food. Increase the supervision of circulation links, improve aquatic product inspection and quarantine, ensure the quality and safety of import and export links, and provide a strong guarantee for the development of the kelp industry.

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