

Feasibility Analysis of Listing of Live Cattle Futures in China

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Abstract

This paper analyzes the necessity of beef production, consumer demand, and live cattle import and export trade based on the actual development status of the live cattle industry in China. Then, it examines the suitability of live cattle and bulk commodities, the futures market function, and the Chicago Mercantile Exchange (CME). The successful listing of live cattle futures demonstrates the feasibility of live cattle futures listed in China on the futures contract design. At the same time, the last of live cattle futures listed in China is summarized and countermeasures are offered with the aim of lowering the level of beef cattle hectareage and addressing the issues of lack of product processing capacity, resources and environment restriction, and backward mode of production and technical problems, The results have certain positive significance to avoid the risk of beef price fluctuation and maintain the stability of the live cattle market by strengthening the breeding and breeding system construction of fine beef cattle, promoting the standardized scale breeding of beef cattle, and advanced production and processing technology.

Keywords: Live Cattle Industry; Live Cattle Futures Feasibility Contract Design

1. The necessity of listing live cattle futures in China

Shen (2009) conducted a feasibility study listing live pig futures. He started from China's live pig spot market and analyzed its production status, import and export trade, price changes, and influencing factors. Liang (2021) analyzed the data on cattle crop volume, beef output, and producer prices from 2002 to 2019 and studied the necessity of China's beef output, import and export trade, and beef price trend based on his conclusions and the data of China National Bureau of Statistics and China Customs in the recent two years.

1.1 Analysis of beef production in China

According to the statistics of the Food and Agriculture Organization of the United Nations, from 2000 to 2018, China ranked third in the world in cumulative beef production and has become the third largest beef producer worldwide. China's beef production has been increasing yearly in recent years. Figure 1 shows that China's beef production reached 6.98 million tons in 2021, representing an increase of 256,000 tons compared with 2020, with a year-on-year growth of 3.80%, according to data sorting and calculation by the National Bureau of Statistics of China. In addition, while China's beef production is growing, the demand is also increasing significantly. As shown in Figure 2, China has become the world's second-largest beef consumer. In 2021, China's beef demand reached 9.30.02 million tons, an increase of 458,000 tons compared with 2020, with a year-on-year growth of 5.17%.

In 2021, China's beef production was 6.98 million tons, but the demand was 9.30.02 million

tons, which indicates that the demand for beef in China is greater than the production, and the demand gap mainly comes from imports. Furthermore, with the continuous improvement of residents' living standards, China's per capita beef consumption is also increasing. According to statistics, in 2021, China's per capita demand for beef will be up to 6.58 kg/person, compared with 2020, indicating an increase of 0.3 kg/person. Consumer demand is constantly expanding, and China's dependence on imported beef is also growing. International beef market prices are affected by animal diseases, economic policy, supply-side yield, exchange rate and other factors, which make it unstable.

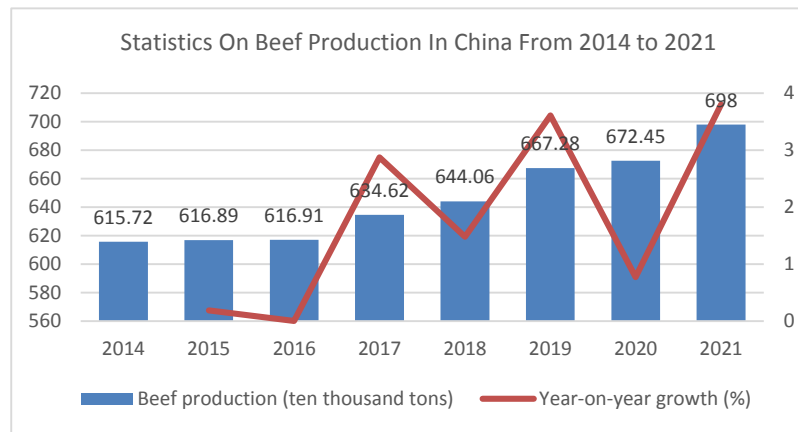


Figure 1: Beef production statistics of China from 2014 to 2021 Source: National Bureau of Statistics of China

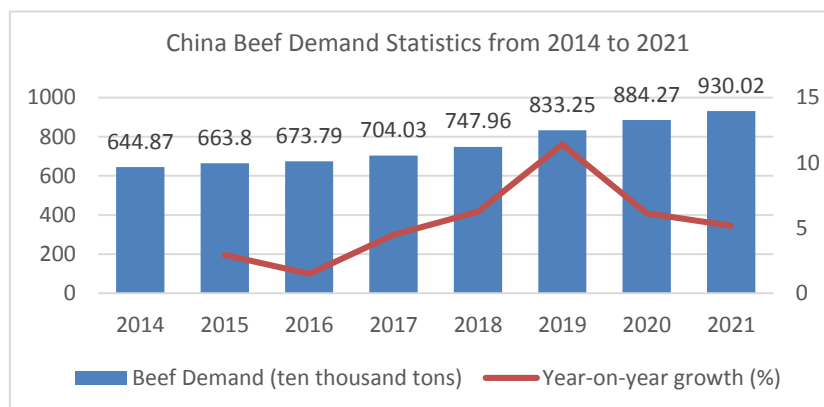


Figure 2: China Beef Demand from 2014 to 2021 Source: National Bureau of Statistics of China

1.2 Analysis of China's beef import and export trade

China imports more beef than it exports. It is one of the largest importers of beef in the world and has the fastest growth rate of beef import. Figure 3 shows that based on China's Customs data, from January to November 2021, China's beef import volume was 2.1269 million tons, and the import amount was 11.181 billion US dollars. The export volume was 0.001 million tons, and the export value was 0.001 billion US dollars. In addition, according to the average import and export price statistics of China Customs, the average export price of beef in China has been significantly higher than the average import price since 2017. From January to November 2021, the average import price of beef in China was 5.26 USD/kg, while the average export price was 10.78 USD/kg.

At the same time, from the import situation of beef subdivided products, the quantity of frozen boneless beef imported by China is significantly higher than that of other types of products. For example, as shown in Figure 4, the quantity of frozen boneless beef imported from January to November 2021 is 1,703,600 tons, and the import amount is 957,320.18 million US dollars, which is the main import subdivided product in China.

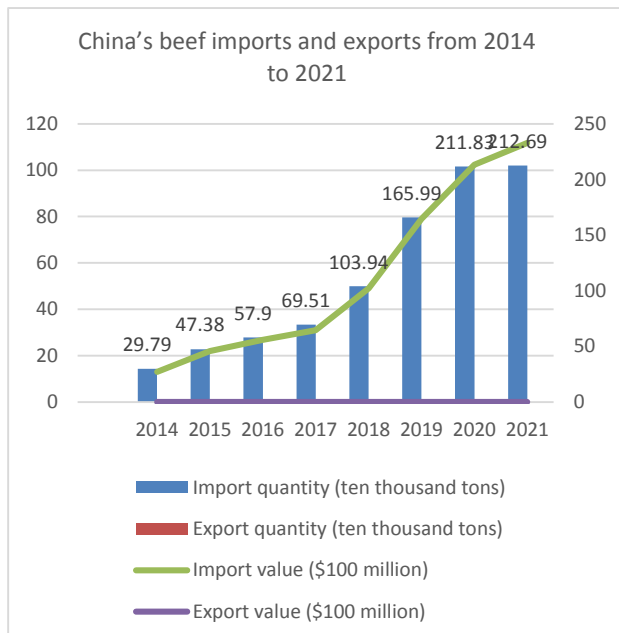


Figure 3: China's import and export from

2014 to 2021 Source: China Customs

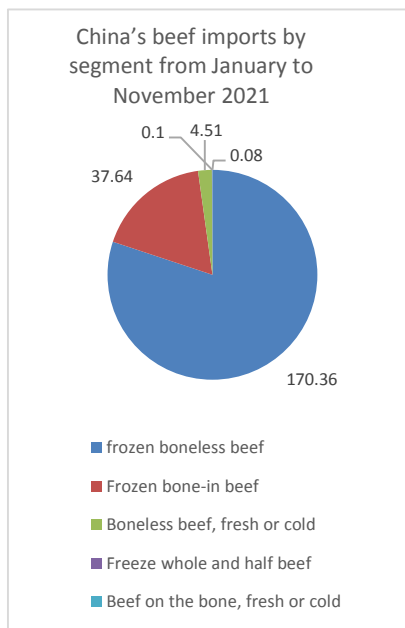


Figure 4: Imports of segmented beef products in China

From January to November, 2011 Source: China Customs

1.3 Analysis of China's beef market price trend

According to the data of the National Bureau of Statistics of China, as shown in Figure 5, the curve of China's cattle (gross weight) production price index fluctuates, and the value in half of the years exceeds the base, indicating that China's cattle production price fluctuates greatly. Therefore, although a price decline can be observed, the overall price is still rising. At the same time, the off-season is not weak. Therefore, the beef price continues to rise. According to the Ministry of Agriculture and Rural Affairs, the nationwide market fixed monitoring of 500 counties shows that in the third week of August 2020, the national average beef price was 83.7 yuan/kg, representing a year-on-year increase of 14.4%, because for the third week of June to the third week of August, the national average beef price had ten consecutive weeks of month-on-month increase of about 2%. At the wholesale end, according to the National Agricultural Product Wholesale Market Price Information System of the Ministry of Agriculture and Rural Affairs, the wholesale price of beef increased month-on-month for eight weeks in a row, from 70.9 yuan per kilogram to 73.2 yuan per kilogram.



Figure 5: 2002-2019 China Cattle (Gross weight) Production Index (base period of last year = 100)

1.4 Summary of this chapter

Based on the above analysis of the actual situation that beef production and per capita demand in China are increasing yearly, the quantity of imported beef is much higher than that

of exported beef, and the price of the domestic beef market remains high, the following conclusions can be drawn:

1. The total demand for beef in China is greater than the total domestic production, and the demand gap is constantly expanding. Moreover, China relies heavily on imported beef. Therefore, the price fluctuation of imported beef will affect the spot market price of live cattle in China and cause market turbulence. Therefore, it is necessary to use the futures market for hedging.

2. The trade deficit seriously hinders the competitiveness of Chinese beef in the international market, and some beef segments are excessively dependent on the import market, resulting in price passivity.

3. In recent years, beef prices in China have continued to rise, and the effects of the pandemic on global beef production are difficult to judge. Hence, beef prices are predicted to remain high in the future. Therefore, it is necessary to stabilize market prices through the pricing function of the futures market to avoid excessive losses.

It can be concluded that it is necessary to market live cattle futures in China.

2. Feasibility of listing live cattle futures in China

2.1 Suitability of live cattle and bulk commodities

Bulk commodities refer to mass-traded material commodities that can enter circulation but are not retail links, have commodity attributes, and are used for industrial and agricultural production and consumption. Beef cattle conforms to the following characteristics of bulk commodities:

1. Large price volatility: Only when the price of a commodity fluctuates sufficiently do traders intend to use the futures market to avoid price risk. The spot market price of live cattle in China has fluctuated greatly in recent years, and the supply side of imported beef in China has been tight in the past two years because of the pandemic, and the price has risen slightly. The future price trend is difficult to predict, and thus, traders have the demand to use the futures market for hedging.

2. Large amount of supply and demand: the exertion of the function of futures markets is based on the premise that commodity supply and demand participate widely in trading. Thus, only sports with large quantities of supply and demand in a wide range of full competition, price formation of authority, and as the world's third largest beef producers and the second largest beef consumer, China has enough to become a commodity in terms of supply and demand.

3. Easy grading and standardization: live cattle futures do not conform to a special commodity that cannot be stocked, but the CME has proved its feasibility with practice. The existing delivery methods for CME live cattle futures are as follows: On the delivery date, the seller can show the certification of animal husbandry and approval certificate; the stall number, cattle numbers, cattle net weight, quality grade, meat estimation and average grade estimation should be listed. When the seller follows the contract's provisions after the delivery, exchanges should be the capital retained by the buyer from the seller. Meanwhile, when the delivery object has been placed in the buyer's custody, the ownership of the herd shall be delivered to the buyer. However, most futures market traders use futures contracts for hedging, risk hedging, or arbitrage, and only a few traders carry out physical delivery. Therefore, CME has introduced three kinds of live cattle futures, namely calf futures, shelves, and beef cattle futures, and thus, China can continue this physical delivery to meet the small traders.

2.2 Live cattle futures price discovery function

Liang (2009) analyzed the price formation mechanism of the futures market when analyzing the feasibility of electric power futures. He concluded that the futures market could provide a formation mechanism for electric power prices and also for live cattle futures because the futures market will have many transaction values of live cattle, arbitrageurs, and speculators

based on the cost of live cattle breeding and anticipated profits as a valuation basis, which prompted them to analyze the beef future price prediction. In an organized futures exchange of public bidding, a fair, accurate and realistic benchmark price can be formed that can truly reflect the supply and demand situation of the live cattle spot market and the resultant effect of a series of factors affecting the price change. In addition, the benchmark price formed by the futures price mechanism will change at any time according to the changes in the market supply and demand relationship, which is dynamic and authentic. Therefore, it can provide an important basis for spot trading pricing and important parameters for the prediction and decision-making of beef cattle suppliers and sellers.

In addition, price is also an important means of resource allocation. A single spot market price is easily manipulated to deviate from its actual value; thus, the optimal allocation of resources cannot be achieved. However, the benchmark price formed by the futures market price mechanism is more authentic, fair, and accurate. These characteristics indicate that after the establishment of the live cattle futures market, beef cattle suppliers can make accurate predictions based on the benchmark price, trading volume, and other public information to avoid the massive expansion of beef cattle breeding or the huge waste of social resources due to the failure to reach the optimal total breeding volume, ensure the balance of production and sales in the live cattle market, and improve the allocation of resources.

2.3 Hedging function of live cattle futures

Wang and Feng (2015) analyzed the hedging principle of national debt futures and combined their conclusion on the live cattle futures to make the following analysis. The futures market has the function of hedging, which can help participants in the live cattle market to avoid risks. Because of the effects of time value and other factors, the live cattle futures price and its subject matter spot price in the two markets have the same trend and direction of price change but differ slightly in terms of fluctuation amplitude. Hedging involves the use of a price relationship between the two markets, the futures market and spot market, at the same time, to conduct trading in the opposite direction, with the profit of one market to make up for the loss of the other market, to avoid the live cattle spot price risk caused by price fluctuations.

In particular, in actual live cattle futures trading, traders can buy futures contracts at the beginning of futures trading and also can sell futures contracts at the beginning of the deal; known as cross trade, trading and hedging breaks even, namely simultaneously two markets related, in the opposite direction, size, break even. For example, live cattle farms can do short hedging to avoid future price declines, while live cattle traders can use long hedging to avoid future price increases. In addition, when the futures contract is close to delivery, the spot and the futures prices tend to be the same, the basic difference between the two prices is close to zero, and the “convergence” of the two markets in the final price also enables the hedging transaction to be effective.

At the same time, the beef cattle futures contract design ensures that the supplier or buyer, without being limited to beef cattle to deliver a growth period at any time of the year, can be traded to circumvent the risk of the future, or the use of short-term price fluctuations for profit, live cattle futures expiration date before buying short futures to hedge positions with physical delivery, which is known as “rolling forward hedging.”

2.4 US live cattle futures

In 1964, the United States CME broke tradition by introducing live cattle futures, the first non-storable futures variety in history. By 1969, CME had developed into the world's largest meat and livestock futures trading center. However, when CME first launched live cattle futures, it suffered from considerable public pressure because of its non-storable subject matter characteristics. In addition, at that time, it was widely believed that live cattle futures did not have the function of price discovery and hedging. However, CME proved that live cattle futures were successful future varieties with time.

Song (2004) described that CME expanded to cope with the effects of the live cattle futures market. On Christmas Eve 2003, a Holstein “mad cow” was found in Washington State in the United States, and many countries announced the suspension of the importation of American beef. This sudden event hugely affected the live cattle futures market in the United States. The price of live cattle futures on CME fell by the maximum limit for three consecutive days, from 92 cents/pound to about 73 cents/pound. Hence, to cope with the market chaos that began on December 23, CME implemented the policy of temporarily expanding the limit of rising and falling live cattle futures on December 24. The daily fall limit was increased from the initial 0.015 dollars to 0.03 dollars and then to 0.05 dollars. After 3.3 times of board trading, the market risk was released, and the trading market gradually stabilized. On January 6, 2004, CME announced the resumption of the live cattle futures price limit of \$0.015. As a risk management tool, cattle futures trading meets beef cattle breeding and slaughtering and enables processing enterprises to cope with the demand of the market price volatility risk, stabilize the beef cattle production, storage and transportation, processing and consumption market, improve the quality of the beef cattle homogeneity, and promote the development of the beef cattle industry specialization, modernization.

Jin, Power and Elbakidze (2008) also expounded on the effects of food panic caused by mad cow disease on futures prices and demonstrated its authenticity through model analysis. Compared with China, although no case of “mad cow disease” has been found for the time being, China’s long-term dependence on imported beef and food panic will cause market turbulence if the supply side is missing, leading to large fluctuations in beef prices and immeasurable losses. The classic case of the US CME using the increase of the futures market to limit and stabilize the market price undoubtedly provides a feasible plan for the live cattle market in China. It again confirms the feasibility of listing live cattle futures in China.

2.5 Summary of this chapter

By comparing the compatibility between beef cattle and bulk commodities, explaining the two main functions of the live cattle futures market, and analyzing the real case of hedging through futures in the live cattle market in the United States, this chapter also draws the following conclusions by combining the outstanding problems of the live cattle industry in the previous chapter:

1. CME has proved that live cattle futures are a successful future variety with time. The live cattle futures market in the United States has helped tens of thousands of farmers avoid risks by using the expanded version. Live cattle futures also conform to the various characteristics of bulk commodities, and thus, listing live cattle futures in China is completely feasible in terms of the transaction process.

2. The spot market of live cattle is extremely unstable because the output of beef in China cannot meet the total domestic demand, the demand gap relies heavily on imported beef, and the demand for beef from Chinese residents is increasing yearly. Therefore, the live cattle futures market can offer the spot market fair and accurate pricing to realize the reasonable allocation of resources. At the same time, it can also use hedging to unwind positions for hedging, stabilize the market price, and solve the problems faced by the current spot market.

The above indicates that listing live cattle futures in China has strong feasibility.

3. Contract design of live cattle futures in China

Referring to the CME live cattle futures contract and the live pig futures contract issued by China’s Dalian Commodity Exchange, the live cattle futures contract in China is designed as follows:

1. Trading varieties: The market cycle of beef cattle is generally 12–18 months, which is longer than the market cycle of pigs at 8–12 months. Therefore, CME creates three kinds of futures according to the stages of beef cattle feeding, which is more conducive to commodity

circulation. Furthermore, the market volume of beef cattle in China is almost the same; thus, the contract design is based on the classification of CME trading varieties.

2. The trading, quotation, and minimum change units are the same in CME live cattle and lean hog futures contracts. Therefore, the live cattle futures contract can be designed according to the measurement habits of China's spot trading market and by analogy with China's live pig futures contract.

3. Daily price fluctuation limit and minimum trading margin: CME live cattle and lean hog futures are not specified. Thus, contract design is carried out according to the general provisions of live hog futures and livestock futures in China.

4. Contract delivery month: China's beef cattle market cycle is roughly the same as that of the United States, and so the contract delivery month is the same.

5. Trading time, last trading day, and delivery date: The contract design is modeled after the live pigs future because of the differences between domestic and foreign transactions, according to the trading habits of China.

6. Delivery grade: China's live pig futures have issued the quality standard for live pigs, but there is no unified delivery quality standard for live cattle in China. Newsome et al. (2004) mentioned starting with the June 1995 futures contract, the deliverable load was changed to 55% select grade and 45% alternative grade live cattle. This change is expected to make any combination of Choice-Select quality grades eligible for carcass transport, greatly expand the range of cattle that can be delivered, and facilitate live cattle market transactions, hence the use of CME delivery standards for contract design in China.

7. Delivery method: Live cattle futures in China are initially listed and do not reach lean hogs futures based on the CME lean hogs index. Transactions are settled in cash and are therefore designed for physical delivery.

To sum up, the design of live cattle futures in China is as follows:

Table 1: Design of live cattle futures contract in China

trade category:	According to the stages of beef cattle feeding, it can be divided into three types: calf futures, shelf cattle futures and beef cattle futures
trading unit:	16 tons/hand
price quotation unit:	Yuan (RMB)/ton
Minimum unit of change:	5 yuan/ton
Daily price fluctuation limit:	±4% of the previous trading day's settlement price
Minimum trading margin:	Five percent of the contract value
Contract Delivery Month:	February, April, June, August, October, December
Contract Delivery Month:	Monday to Friday (except Beijing time legal holidays) 9:00-11:30 am, 13:30-15:00 PM
last trading day:	The fourth last trading day of the contract month
date of delivery:	The third trading day after the last trading day
Delivery grade:	Refer to the CME Delivery standard: A standard delivery unit is 40,000 LBS of USDA estimated meat grade 3, 55% Select, 45% Alternative live cattle, each weighing between 1050 LBS and 1500 LBS.
manner of delivery:	physical delivery

4. Conclusions and suggestions for listing live cattle futures in China

4.1 Conclusions related to the listing of live cattle futures in China

Sun et al. (2018) and others explored the live cattle industry in China to study the current situation and propose solutions to the problems of development countermeasures in China's

imported beef cattle industry. However, the industry is faced with the pressure of competition at the same time, key technology, such as beef cattle breeds cultivation, processing and sales areas, still lags behind that of the cattle industry in developed countries. Thus, promoting beef cattle industry development in China should take the market as guidance to speed up the development of its live cattle industry and introduce it to the market and consumer groups. Hence, the author made the following conclusions and offered countermeasures based on their analysis.

1. Beef cattle have a low level of improved breeding and lack product processing capacity. Therefore, beef production is directly related to beef cattle breeds. Although the number of beef cattle raised in China ranks among the top in the world, the degree of improved breeding is low, and the loss of good traits is serious. In addition, beef and beef production are closely related to segmentation and other advanced processing technology. In contrast, the beef processing equipment and technology between China and developed countries differ greatly. With beef cattle industry chain industrialization, standardization, marketization and inadequate cultivation factors, China's beef processing added value is still less than a third of the developed countries. Therefore, the breed of beef cattle directly affects the quality of beef, whether the quality of beef can reach the international delivery standard determines the smooth progress of futures trading, and the pure goodness of beef cattle breeds is of great importance to the listing of live cattle futures.

2. The production mode and technology are backward, and the resource and environment constraints must be strengthened. Although the production mode of beef cattle in China has changed significantly compared with the past, a highly professional and mature production mode has not yet been formed. Thus, the utilization efficiency of beef cattle feed and the finishing effect cannot be guaranteed. Therefore, improving the quality and specifications of beef cattle will be difficult. Furthermore, the carcass weight of each beef cow in China is about 100kg lower, and the cost of beef production is more than double the international average level, which seriously affects the competitiveness of beef products in China and is not conducive to trade in the live cattle futures market. At the same time, the comprehensive utilization rate of standardized beef cattle manure is not high, the environmental pollution problem is prominent in some areas, and the pressure of environmental protection is great, all of which hinder the further expansion of live cattle market production.

4.2 Suggestions on listing live cattle futures in China

After this chapter, the lower level of beef cattle's entire hectareage will be shown to affect meat quality. Hence, to meet the delivery problem, the actual situation of beef cattle breeding resources environment stress and because the conclusion in the previous chapter mentioned the high cost of beef exports to China, a sweeping competitive price passive state, beef cattle production mode that causes the beef production to fall behind and not meet the domestic demand, leading to a series of problems, such as import dependence and market turbulence. Therefore, the following suggestions are put forward:

1. Strengthen the breeding and breeding system of fine beef cattle. A plan for the genetic improvement of beef cattle should be promoted, and vigorous support should be given to construct national core breeding farms for beef cattle. Moreover, production performance testing should be standardized, and breeding enterprises should be urged to improve the quality of on-site testing and the quantity and quality of outstanding domestic breeding stock. Furthermore, the construction of infrastructure of livestock or poultry genetic evaluation centers should be strengthened. The accuracy and timeliness of genetic evaluation should be improved, accelerating the main beef cattle breeding process. Combined with local cultivation, strengthening the beef cattle breed will jointly foster innovation, choosing the group scale, good existing hybrid breeding group to carry out the cross-breeding, and improving the production performance of bred and introduced varieties.

2. Standardized large-scale beef cattle breeding and advanced production and processing technologies should be promoted. Standardized scale breeding is an important way to adjust the structure and change the mode of the beef cattle industry. It is necessary to continue expanding the implementation scope of beef cattle standardized scale breeding projects, further support the upgrading and transformation of moderate-scale beef cattle farms, and improve standardized production. The new environmental protection concept should be implemented, the relationship between product development and the environment should be handled properly, the process research of feces collection should be accelerated, and the equipment preparation rate of feces treatment and utilization infrastructure should be improved in large-scale cattle farms. In the downstream of the industry, centralized slaughtering, brand management, and cold chain fresh meat should be the main directions to promote standardized slaughtering of beef cattle, optimize the structure of beef and its products, accelerate the classification and grading of meat products, and expand the market share of cold fresh meat and cut meat.

5. Conclusion

With the increasing demand for beef per capita in China, the live cattle market will gradually expand, and thus, carrying out live cattle futures trading is significant. Live cattle futures are based on avoiding the loss caused by the live cattle spot market price fluctuation and compensating for the risk of live cattle spot trading. Meanwhile, live cattle futures price is also a guiding benchmark pricing that helps live cattle traders to make investment decisions and optimize the reasonable allocation of resources. In addition, the live cattle futures market improves market transparency and promotes the circulation of live cattle trading. Therefore, developing live cattle futures trading in China is feasible from the perspective of hedging of live cattle futures market traders or maximizing beef cattle resource benefits.

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