

Research on Dairy Product Quality Risk Identification and Early Warning Strategies from a Green Supply Chain Perspective

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Abstract

With the rapid growth of the domestic social economy, the lag in the development of quality and safety management in the domestic dairy industry has gradually emerged. People increasingly value the quality and safety of dairy products, but it is difficult to ensure the quality and safety of domestic dairy products. Due to the special characteristics of dairy products such as their perishability and wide coverage of production processes, how to ensure the product quality of dairy products from the perspective of the supply chain is an important factor in guiding the safe production of dairy products. This project starts from the perspective of green supply chain, improves the supervision of dairy product safety and quality in all aspects of the supply chain based on meeting the requirements of energy conservation and emission reduction, and carries out risk identification for dairy product quality through the construction of BP network neural system; Finally, based on the concept of green supply chain and quality chain, the quality and safety early warning strategy for China's dairy industry was studied.

Keywords

Green Supply Chain; Quality Chain; BP Network Neural System; Dairy.

1. Introduction

With the rapid growth of the domestic economy, the lagging development of the domestic dairy industry has gradually become apparent. The quality and safety of dairy products are becoming more and more important to the nation, but the quality and safety of dairy products in China is difficult to be guaranteed. Based on the perishable nature of dairy products and the wide range of production processes, it is important to ensure the quality of dairy products from a supply chain perspective to guide the safe production of dairy products.

This project firstly, through field research and the collection of relevant data, information and literature, provides an overall analysis of the current supply chain management in the domestic dairy industry and the risks of product quality in domestic dairy products, and points out the shortcomings in existing research. Secondly, we define the connotation of green supply chain and dairy product quality risk by drawing on relevant theories such as supply chain management and product quality management. Then, based on the identification and selection of dairy product quality and safety risk factors, a BP neural network system is used to construct a dairy product quality and safety risk early warning model, and through data simulation, quality risks are predicted for dairy products. Finally, targeted strategies are proposed to promote traceability, quality assurance and risk control of dairy products.

2. Research Background

2.1. Research Significance

The domestic dairy industry grew at an average rate of 17.4% in the decade leading up to 2008, but since the melamine incident in 2008, the reputation of the Chinese dairy industry has

suffered repeated blows due to ongoing quality issues. Since 2008, the growth rate of China's dairy industry has slowed down significantly, and the domestic dairy industry is becoming saturated, with Mengniu and Yili sharing the main market share. There are many dairy products with safety and quality problems in the domestic market. The domestic dairy market is still overly dependent on imported dairy products, with imports reaching 17.22 million tonnes in 2019. China's current product quality management model for dairy enterprises can hardly meet the needs of the country's development of Chinese-style modernisation. In view of the various problems facing the development of China's dairy industry, a dairy product quality risk identification and early warning management model under the concept of green supply chain is an inevitable choice to achieve dairy product safety and healthy development of the industry.

2.2. Current Status and Developments of Domestic and International Research

At present, there are more studies on the identification and early warning of appropriate risks of dairy products in academic circles at home and abroad, and the topics related to the study of this paper mainly include the study of food safety supervision system and the study of product quality and safety in the supply chain of dairy products. Like domestic scholars Xie Min for domestic dairy product safety issues, through questionnaires as well as asking experts and other opinions, using factor analysis to identify the quality risks of domestic dairy products. The quality chain was first proposed by Troczynski at Columbia University in Canada, and was refined by experts in a series of processes, resulting in the quality chain being a long and constantly changing chain structure that covers the entire process of product production. The core of the quality chain is quality information. Through various methods of statistics, sorting and analysis of quality information, the problems in the quality chain as well as the elements and links where the problems occur can be investigated, so that the quality of products can be improved through targeted improvement of the problematic links. Based on the quality chain theory, Yang Jinhao carried out research on the identification of quality risk influencing factors of dairy products, the construction of quality risk transfer model and quality risk classification and early warning, and constructed a Bayesian network model for quality risk transfer in the quality chain by the D-S evidence synthesis method, and used the k-means algorithm to realize the quality risk classification and early warning for multiple batches of dairy products. Xie Min firstly analysed the quality and safety risk factors as factors and considered the need to strengthen the internal and external monitoring of dairy products for possible risks, and then built a monitoring system that combines the HACCP system as internal control with external management such as the government and through an information tracking system.

At present, domestic dairy enterprises are more likely to maximise their economic benefits through supply chain management, without taking into account the environmental and resource costs, and lacking a "green" concept. Green supply chains, through cooperation with upstream and downstream enterprises, as well as internal communication, can optimise the overall environmental benefits in the whole supply chain process, while improving the environmental and economic performance of the enterprise, thus achieving sustainable development of the enterprise and its supply chain. This project is based on a green supply chain approach to dairy product quality risk identification and early warning strategies, taking into account relevant domestic and international literature.

3. Research Objectives and Main Content

3.1. Research Objectives

The overall objective of this project is to identify dairy quality risk factors from the perspective of green supply chain, discuss dairy quality early warning strategies, and conduct case analysis on a factory of Mengniu Dairy. Firstly, through the field investigation and exploration of the

existing supply chain system of a factory in Mengniu, the shortcomings of the existing supply chain of the dairy industry are analyzed and summarized. Secondly, our team tried to find a product quality management model suitable for China's current social development by inquiring relevant information and exploring and analyzing the production mode of international dairy companies and the international dairy industry. From the perspective of green supply chain, we have built a product quality management model combining green supply chain and quality chain through in-depth analysis of quality chain. Finally, through the analysis and summary of a series of risk prediction systems, we try to find an evaluation model suitable for risk estimation of dairy product quality, and finally through comprehensive evaluation, we decide to identify and select the risk factors of dairy product quality and safety from the perspective of green supply chain, and build a BP neural network system to evaluate and warn dairy product quality risks. The research objective of this project is to try to find a product quality supervision model suitable for the green and healthy development of domestic dairy enterprises from the perspective of green supply chain, which can improve environmental protection while improving product safety and quality and improving the income of dairy enterprises, so as to form a virtuous circle in the dairy industry and increase the average annual milk production of domestic people.

3.2. Main Content of the Study

3.2.1. Theories and Concepts Related to Green Supply Chain and Dairy Product Quality Risk

Green supply chain and dairy product quality risk related theories and concepts Green supply chain is based on green manufacturing theory and supply chain management technology. It is committed to making the entire process of product selection, processing, packaging, transportation, use, and recycling, with minimal environmental impact and highest resource efficiency, so as to achieve environmental protection and improve economic efficiency, and achieve sustainable development. The entire process of the supply chain in the dairy industry and the green design of products are environmentally and ecologically oriented, making the green supply chain the starting point. At the dairy design stage, the impact of the entire future life cycle of dairy products on resources and the environment should be fully considered to avoid excessive waste of resources. This project aims to supervise the quality chain of dairy products through information disclosure processing for products in the green supply chain system. Firstly, through the traceability of forage and dairy farming, the greenness of raw milk and the quality information of raw milk are controlled and monitored; Secondly, implementing a traceability process for dairy products produced by manufacturers to enable consumers to understand which manufacturer produced the dairy products they purchased; Finally, track and supervise the packaging of dairy products, and carry out green recycling treatment for waste packaging and expired products that need to be recycled. The dairy product quality management system built by combining green supply chain and quality chain fundamentally eliminates the occurrence of problems and solves them.

3.2.2. Identification and Selection of Risk Factors for Dairy Product Quality and Safety from the Perspective of Green Supply Chain

Starting from the perspective of green supply chain and combining relevant knowledge of dairy product quality chain, identify, evaluate, and select the development profile of case enterprises and quality risks of dairy products. It is proposed to confirm that the level of large-scale breeding, feed quality, veterinary drug quality, mechanized milking, production and processing water, production and processing equipment, food additives, and concentration of dairy production and processing industries are risk variables of the dairy industry through field research in a factory in Mengniu. Then, the risk factors of dairy products in a factory in Mengniu

can be obtained through calculation of relevant data and query of information, and optimize the design of these risk factors based on the concept of green supply chain.

3.2.3. Early Warning Analysis of Dairy Product Quality Risk based on Bp Neural Network System

Based on the field investigation and relevant data query summary of a factory in Mengniu, and based on the dairy product quality risk variables of a factory in Mengniu, it is found that the product safety status of dairy products can be reflected through certain early warning indicators, so the selection of early warning indicators is the key to effectively achieving dairy product quality and safety risk early warning. By querying relevant data and selecting one warning indicator and eight warning indicators from the dairy production and processing process, a dairy product quality and safety risk early warning indicator system is constructed, and the BP neural network system is used to simulate and analyze the dairy product quality risk early warning.

4. Conclusion

President Junlebao once stated in a report that the domestic milk powder market in China is basically monopolized by imported milk powder, and most households would rather spend higher prices on imported products than support domestic milk powder brands. In 2022, China imported 265600 tons of infant formula powder, a year-on-year increase of 1.5%. The reason for this is that since the melamine incident in 2008, domestic milk powder brands have still been labeled as unsafe in the hearts of domestic consumers. From this, we can see that domestic households attach great importance to the safety of dairy products, and domestic dairy products enterprises can no longer face quality and safety issues of dairy products. The necessity and importance of establishing a regulatory mechanism for dairy product safety were emphasized once again. On the one hand, establish incentive mechanisms for various links in the dairy supply chain, starting from grass farming, increase subsidies, and reduce the "additive" grass caused by human interests. By establishing a reward mechanism to reduce the safety issues of dairy products caused by subjective factors, and by establishing a BP neural network neural system, safety and quality supervision of the dairy supply chain can be carried out to objectively reduce the possibility of dairy product safety issues occurring.

References

- [1] HongMei Su, ChengFu Zhang, JunHua Liu. Construction and Analysis of the Conceptual Model of Service Quality in Green Supply Chain of Dairy Products [J]. Journal of Inner Mongolia University (Natural. Science. Edition), 2022,53(02):210-215.DOI:10.13484/j.nmgdxzbk.20220214.
- [2] JinHao Yang. dairy product quality risk identification, transmission, and grading early warning based on quality chain [D] Zhejiang Business University, 2021. DOI: 10. 27462/ d. cnki. ghzhc. 2021. 000718.
- [3] BaoGuang Bai, HongLei Zhu, QingXiu Fan. Application of BP neural network in early warning of dairy product quality and safety risks [J]. China Dairy Industry,2020,48(07):42-45+57. DOI: 10. 19827/ j. Issn 1001-2230.2020.07.009.