

# Research on Green Supply Chain Optimization of Fresh Food e-Commerce Platform Under New Retail Mode: Taking Fresh Hema as an Example

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**Abstract:** With the advancement of information technology, including the Internet, and the rising living levels of the Chinese people, more and more people choose to use online platforms to buy fresh food and other necessities of life, with Fresh Hema as a representative of fresh food platform enterprises balancing online and offline, practicing the new retail model, attracting a large number of consumers. As the concept of sustainable development is gradually being emphasized, companies like Fresh Hema need to transition to environmental protection and build a green supply chain. Taking the supply chain approach of Fresh Hema as an example, to analyze the environmental issues and put forward effective measures to build a green supply chain to provide reference for the majority of fresh food platform enterprises.

## 1 INTRODUCTION

Recent years have seen the e-commerce sector grow quickly, Internet technology become more and more popular and convenient, the product line has continued to grow, and the new retail model centered on O2O is emerging, occupying the consumer market and becoming a new choice for consumers. Consumers' willingness to buy online has increased, and they are gradually getting used to online shopping, and the demand for daily fresh products is also increasing, which makes the scale of fresh food e-commerce platforms expanding. Fresh products have a very short shelf life and require efficient supply chain transportation to ensure product quality. However high efficiency is not the only requirement for the supply chain. The Chinese government mentioned the need to build a green supply chain in the "Guiding Opinions of the State Council on Accelerating the Establishment of a Sound Green, Low-Carbon and Cyclic Economic System" issued in 2021, in which enterprises should take environmental impact and resource efficiency into account in the supply chain. However, the poor economic conditions in recent years have led to a decline in people's consumption power, coupled with fierce competition


from various fresh food platforms, how to implement and optimize the green supply chain has become an urgent issue for enterprises to consider.

New retail is a new mode of retailing that utilizes the Internet, takes into account the ecological and business structure through digital and intelligent means, and integrates online and offline and modern logistics.

The green supply chain was first proposed by the Manufacturing Research Association of Michigan State University in 1996, with a focus on resource efficiency and environmental effect, this contemporary management style is grounded in supply chain management technology and green manufacturing philosophy, which ultimately makes the products in the supply chain, with the most resource efficiency and the least amount of environmental harm.

Green supply chain management can be defined as the integration of an environmental management system into the supply chain process, together with cooperation between suppliers, customers, and logistics service providers to exchange knowledge and information to enhance environmental performance (Tseng et al., 2019).

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Fresh Hema is used as an example. The supply chain model of Fresh Hema is analyzed in this article under the new retail mode, and a supply chain optimization path based on the green supply chain idea is suggested. This paper's practical value lies in its analysis of Fresh Hema's situation, which enables the company to modernize its supply chain and create a green supply chain that other fresh food retail businesses can use as a model.

## 2 SUPPLY CHAIN

Supply chain refers to the production and distribution process, involving the upstream and downstream enterprises to provide products or services to the end-user activities formed by the network chain structure, that is, the product from the business to the hands of consumers throughout the chain. For a fresh food platform, the supply chain is the key to determining whether the platform can run smoothly, China and foreign fresh food platforms, always actively build to improve the supply chain, to provide customers with better quality service.

### 2.1 Situation in China

The vast territory and diverse topography and climate make China's fresh products rich in variety. Because fresh products are fresh, easily perishable, seasonal, not easy to store, and in high demand, they have higher requirements for the supply chain.

At present, China has nearly 230 million farmers, and more than 91% of them are still in the "small farm economy" production mode, i.e., production is scattered, lack of unity, specialized management, and low production efficiency, so the main distribution of fresh agricultural products in China is still based on the wholesalers' multilevel distribution in the place of production and marketing. In terms of sales methods, China has a variety of parallel supermarkets, vegetable farms, and e-commerce.

China's current fresh food channels are still dominated by farmers' markets, and because of its high freshness, affordable prices, fast and safe, etc., it will remain the primary method of selling fresh food for a very long time. However, due to the in-depth implementation of the policy of "farmers market to the supermarket" and the penetration rate of new channels such as fresh food e-commerce, the proportion of farmer markets is decreasing, and the coverage of online fresh food users is becoming more and more extensive (Zheng & Zhu, 2024).

### 2.2 Situation in Other Countries

This part takes the United States as an example. The U.S. fresh food B2B model is very successful, thanks to the standardization of the macro-environment, including the mechanical automation of upstream agriculture and the scale of downstream catering enterprises. From the source of upstream agricultural products, the United States has a high degree of agricultural scale, specialization, and mechanization, with more concentrated planting sites and a large production scale of individual farms. This has greatly reduced procurement costs and operating costs for fresh produce companies. B2B for intelligent fresh food can be useful in the supply chain, integrating downstream demand, determining production by sales volume, guiding the upstream agricultural production cycle and scale, and reducing the risk of stagnation. From the downstream consumer situation, large retailers in the United States for the wholesale business opened the By-Pass system. The customer-customized production model, specialty store sales model, and national or global warranty service model adopted by many producers have brought consumers and manufacturers closer together directly.

### 2.3 Situation of Fresh Hema

Founded in 2015, Fresh Hema is a new retail platform under Alibaba that is driven by data and technology and is a benchmark company in China's new retail industry. Different from traditional retail, Fresh Hema integrates supermarkets, restaurants, and food markets. Fresh Hema under the new retail model uses technologies such as big data, mobile Internet, and intelligent Internet of Things to match people, goods, and fields to achieve optimization (Wang, 2023). Fresh Hema uses the O2O model, i.e., online and offline, but different from traditional O2O. In contrast to traditional O2O, which is Online to Offline, Fresh Hema's O2O is Offline to Online. This can be understood as bringing offline traffic online, assisting clients in using their offline shopping acumen to shop online, encouraging the habit of online consumption, and guaranteeing that the quality of both offline and online products is the same. Products purchased offline and online are of the same caliber (Zhu, 2022).

The current supply chain model used by Fresh Hema is broken down into four sections, including the supply side, the processing and inspection center (DC), offline stores, and logistics.

On the supply side, Fresh Hema adopts a direct sourcing model, purchasing high-quality fresh products such as aquatic products, fruits and

vegetables, and dairy products from all over the world, and cooperating with Coles, NH Foods from Australia, Migros from Switzerland, Driscoll's from the U.S., and MOWI from Norway. At the same time, Fresh Hema also purchases fruits and other products from mature agricultural bases in China, such as Sanya Mango Base and Lingshui Maidenhair Fruit Base, and enters the bases directly to complete the processing and inspection of the products. Meat and vegetables are purchased from local enterprises and cooperated with them, and they are often ordered in the morning and delivered to offline stores for sale in the afternoon.

The Processing and Inspection Center (DC) is responsible for the processing or storage of commodities. The Processing and Inspection Center conducts quality inspections of globally procured products, as well as transshipment and temporary storage of live fish. Therefore, the Processing and Inspection Center also has room-temperature and low-temperature warehouses. Finally, the products are packaged, standardized, and sent to offline stores.

The offline stores are based on the concept of integrated stores and warehouses, with both sales and warehousing functions. Customers can shop in person at offline stores, which are equipped with a food processing system that allows them to buy and eat the raw materials directly from the staff. The offline stores also serve as logistics centers for online shopping. Customers can place an order through the Fresh Hema APP, and the goods will be delivered to their door by the nearest store. For the selection of offline stores, Fresh Hema analyzes a large amount of shopping data and courier addresses owned by Taobao and Tmall to know the crowd density and consumption habits. A schematic of the complete supply chain of Fresh Hema is shown in Figure 1.

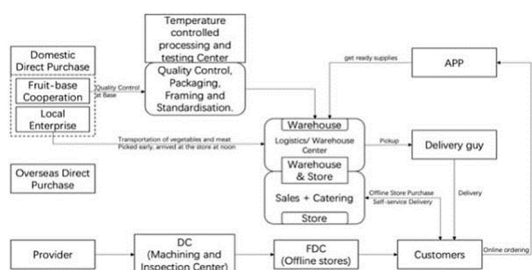


Figure 1: Fresh Hema’s Supply Chain (Photo/Picture credit: Original).

In terms of logistics, Fresh Hema puts forward the slogan of "30-minute delivery", relying on the computing power of big data, a fully digitalized system with hanging conveyor belts in the store, which makes the process of goods from entering the

store to delivering them to the customers very efficient, and the error rate are extremely low. Deliveries within three kilometers of the store can be made in about thirty minutes (Wang, 2023).

With the further pursuit of green business, the concept of ESG (Environmental, Social, and Governance) has come into the public's view. The ESG governance concept emphasizes green and sustainable development and focuses on the long-term interests of enterprises, which can effectively inhibit enterprises from pursuing short-term interests due to internal and external pressures, reduce the short-sighted behavior of managers, and enhance the level of corporate risk-taking (Peng et al., 2024). In exploring the path of ESG, Fresh Hema focuses on the organic series, upgrading the organic series products, restructuring the supply chain, assisting in rural revitalization, and providing consumers with high-quality experiences.

On June 5, 2023, Fresh Hema established a Sustainable Development Department to focus on promoting sustainable development in agriculture and supply chain and established long-term partnerships with more than one hundred organic enterprises, with more than thirty "Organic Hema Villages" across the country, where all fruits and vegetables are free from the use of chemical pesticides, to avoid exposing agricultural operators to agricultural chemicals. All fruits and vegetables do not use chemical pesticides, which prevents agricultural workers from being exposed to agricultural chemicals. Behind the low-priced and high-quality organic vegetables, Fresh Hema uses the order agriculture model to expand the supply chain's upstream and downstream. protects the interests of farmers with stable supply relationships, reduces purchasing costs, and ultimately allows consumers and farmers to benefit at the same time.

Fresh Hema is reducing resource waste, as well as farmers' losses and agricultural wastage, through a combined supply chain model that maximizes utilization by grading. For example, the specification and appearance of substandard Yunnan Menglian avocado is made into ice cream; Beijing organic Pinggu peaches of different sizes are processed into freeze-dried peach crisp, which allows each mu(a Chinese unit of area equal to 1/15 hectare) to reduce the waste of fresh peaches by 400 jin (a Chinese unit of mass equal to 0.5 kilograms) and increase the net income of 1,200 yuan per mu.

Fresh Hema promotes eco-agriculture, encouraging efficient and sustainable agricultural operation modes such as intercropping, three-dimensional agriculture, and multi-level recycling of

materials and energy, to resolve the conflict between human beings and the natural environment while exploring more economical eco-agriculture modes. Under this business philosophy, Fresh Hema actively cooperates with international environmental organizations. For example, Fresh Hema and IFAW (International Fund for Animal Welfare) jointly created the Zero Carbon Elephant Honey Project, which helps local farmers increase their income and alleviates the human-elephant conflict caused by farmers going into the mountains at night to cut rubber. Zero Carbon Elephant Honey is available in stores nationwide, and a portion of the profits are used to support the sustainable development of local communities, including planting eco-friendly fruit trees instead of rubber and installing photovoltaic power generation equipment to neutralize carbon emissions from the production process.

Fresh Hema actively participates in the practice of circular economy and brings the concept of environmental protection closer to consumers. On World Environment Day 2023, Fresh Hema and Corona jointly launched the "Zero Plastic Payment" campaign, where consumers can bring recycled plastics to offline stores, and exchange the plastics for a corresponding amount of money.

### **3 OBSTACLES IN FRESH HEMA**

Through the continuous development and construction of Fresh Hema, Fresh Hema has established a three-dimensional supply chain network with a three-tier network and five major centers. The three-tier network refers to the national central warehouse, regional central warehouse, and city warehouse. The five centers refer to the room-temperature logistics center, low-temperature logistics center, fresh food holding center, processing center, and central kitchen.

In the concurrent creation of an entire supply chain, the new retail model of Fresh Hema will be online and offline integration, the reasonable use of Alibaba's ecological data, in the data and technology of the dual-support, and ultimately to form their ecological circle. The perfect combination and utilization of big data, the Internet, intelligent equipment technology, and the commercial operation of new technology help optimize the match between logistics, people, goods, and the field, which has become the biggest difference between Fresh Hema and traditional offline stores. Furthermore, the implementation of Fresh Hema's unmanned self-checkout service model has resulted in the

replacement of the manual checkout mode in large commercial supermarkets around the nation.

The concept and model of new retail has attracted many customers to Fresh Hema, making it more and more popular, and more and more city residents are choosing Fresh Hema. However, as time goes on, more and more problems such as "using rotten apples to squeeze juice", "charging extra environmental protection fees", "durian varieties falsified" and so on, Fresh Hema has continuously encountered bumps in the process of building a green supply chain, Fresh Hema has been encountering bumps in the road.

#### **3.1 High Level of Dependence on Suppliers**

Fresh Hema relies on global sourcing and direct sourcing from production bases for its products and has a high degree of dependence on its suppliers. If suppliers have insufficient supply in terms of product quantity or falsification in terms of product quality, such as the incident of Fresh Hema's use of rotten and decayed apples to squeeze juice from a juice supplier on October 10, 2018, it will have a serious impact on the entire Fresh Hema's supply chain, and after Fresh Hema makes a swift move to take down the shelves as well as to stop receiving the supply, it will result in the out-of-stocking of the products related to apple juice and the opening of a returns channel resulted in a loss of finances and, in more serious cases, a loss of consumers. Inappropriate disposal of existing stock can also lead to environmental damage and waste of resources.

#### **3.2 Limited Cold-Chain Logistics Technology**

Cold chain logistics covering the whole store and the demand for transportation of numerous fresh products have led Fresh Hema to develop cold chain logistics technology on a large scale, which requires high capital. The development of cold chain logistics is sluggish at this point due to Fresh Hema's lack of cold chain logistics talent, although the quality of fresh products is still affected. The operation of large-scale refrigeration equipment consumes a large amount of energy and generates a large amount of noise and a large amount of waste, which has a considerable impact on the environment.

#### **3.3 Limited Store Coverage and Poor Delivery Results**

Fresh Hema's offline stores are mainly laid out in

first- and second-tier cities. Due to the time characteristics of fresh food, almost only the range within 3km from the offline stores is an effective logistics range, which determines that Fresh Hema's logistic coverage across the country is not very large. The distribution of Fresh Hema's offline stores can be seen in Figure 2.

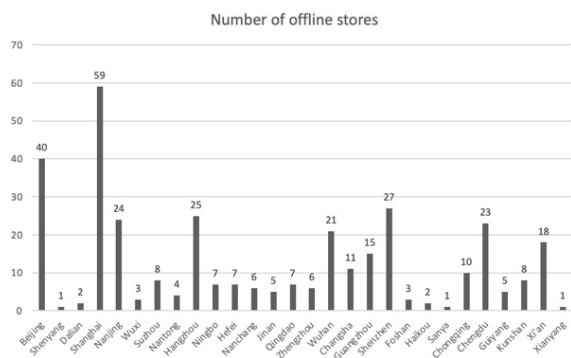


Figure 2: Fresh Hema's Offline Store Distribution (Photo/Picture credit: Original).

Consumers have reported that Fresh Hema's claimed 30-minute delivery is difficult to reach fulfillment in a certain portion of stores across the country, and that certain orders have serious overtime, ranging from one hour to five hours overtime. Distribution focus delivery staff only accounted for a part of the majority of stores rely on the sea of people tactics, a large number of orders can only rely on a large number of delivery staff stack, and can only barely reach a general level of delivery.

### 3.4 Polluting Packaging Materials

In 2021, with the promulgation of the policy of restricting plastics, some domestic head catering and tea beverage enterprises have banned plastic straws and plastic lunch boxes, which are mainly made of PP, and switched to paper straws, aluminum foil lunch boxes, and other more environmentally friendly replacement products. However, in the field of supermarkets, PP plastic film is still used in numerous boutique fruit and vegetable products. This PP material takes hundreds of years to fully degrade in the natural environment and is therefore extremely damaging to the environment.

### 3.5 Pompous and Excessive Packaging

Some fruit and vegetable products are over-packaged on the outside to show off a sense of high class. Dutch beans, millet peppers, carrots, and other fruits were put into the plastic film, and oatmeal, spinach, celery,

and other leafy green vegetables were all packaged in plastic bags. Even cabbage, cauliflower, and eggplant were first set on a circle of sponge netting and put into a square plastic box, the outside also needed to be wrapped in several layers of plastic film, all unfolded after more than 1 meter long. This fruit and vegetable "dress" mode can enhance the price, and reduce the damage rate of fruits and vegetables. For consumers, sometimes excessive packaging, results in consumers not being purchased on demand, and not finishing eating caused by the waste of plastic bags and vegetables.

## 4 DISCUSSIONS

In light of the supply chain issues that Fresh Hema is currently facing and the notion of a "green supply chain", this part gives some ideas of digitalization and intelligence to promote the construction and upgrading of a green supply chain, and provides references to the question of "how to build a green supply chain for fresh food platforms".

### 4.1 Digitization Builds Green Foundation

Relying on Alibaba, Fresh Hema has great advantages in digital systems, big data analysis, cloud computing, and other technology research and development and application. Fresh Hema needs to understand users' needs based on data, in all aspects and from multiple angles, and utilize other Apps under Alibaba, such as Tmall, Taobao, and Alipay, to collect customers' data, and analyze users' profiles through big data, and then understand the customers' needs, so that every customer can see the push information that meets his or her preference when opening the Fresh Hema APP. After extensive collection and analysis of customer needs and consumption preferences, the logistics center will unify the proportion of products in offline stores, know what products should be placed on the shelves, improve ping efficiency, and reduce the waste of items with less customer demand.

Big data algorithms are used to plan the optimal route to reduce transportation energy consumption, as well as to shorten the delivery time and increase the efficiency of delivery work. An Improved Ant Colony Algorithm (ICAO) is proposed from the perspective of takeaway delivery workers for takeaway delivery path planning research. Firstly, the initial planning path is obtained by solving the ACO algorithm, then the initial planning path is optimized by the large-scale neighborhood search algorithm,

and the solution quality is improved by combining the ACO and LNS algorithms. The IACO algorithm can not only improve the intelligent level of distribution, but also improve the distribution efficiency, and realize the sustainable development of the distribution network interconnected distribution system (Tang et al.,2023).

## 4.2 Intelligence to Enhance Green Capabilities

Intelligence is the first leap in the construction of a green supply chain, which opens up the information flow channels of each link through digitization and intelligence. Digital resource coupling breaks down the information silos of various information systems, interconnects various nodes in the supply chain, and realizes "physical-virtual" interoperability, to improve the efficiency, environmental protection, and security of the supply chain (Zhang et al., 2024).

In the processing and testing center, the use of automated packaging production lines can improve the production efficiency of packaging, reduce the waste of packaging materials, and save labor costs and raw material costs for enterprises.

The use of data analysis and prediction technology, the implementation of food packaging safety supervision and monitoring, and food packaging safety of the safety hazards that exist promptly to predict and alarm. The use of image recognition and detection technology can monitor the surface of the food packaging of foreign objects, bacteria, or damage, and the use of automated means to solve the problem, effectively preventing food from being contaminated, which results in food waste. Intelligent monitoring systems, blockchain technology applications, automated processing and decision support, and other technologies (Liu, 2023) can also be used to replace the original manual inspection and monitoring, reduce the rate of misjudgment, improve supply chain efficiency, automate the packaging production line, intelligent decision-making, and promote the digital transformation of processing and testing centers to achieve lean production.

Learning from Jing Dong Logistics, the development of intelligent insulation box technology, Jing Dong's independent research and development with the U.S. FDA standards of the fifth generation of VIP material insulation box can be recycled, better than the industry norm in terms of insulating time, storage space, etc., the service life or the industry's 2-3 times, greatly saving the loss of packaging. Through real-time monitoring of the location of fresh cold

chain packaging, the temperature of fresh commodities inside the packaging, and other quality control information, the development of intelligent temperature control technology offers comprehensive and superior logistics protection for fresh products. Realize intelligent temperature control sharing function, establish intelligent temperature control system for the whole cold chain, realize comprehensive monitoring of temperature change, transportation speed, and distribution time in each link of fresh storage, transportation, and distribution, and guarantee the safety of fresh food (Yang & Wang, 2020).

Fresh Hema can also learn from Amazon Fresh to set up receiving boxes, these boxes can be fixed on the wall outside the buyer's door, according to the characteristics of different fresh products set up three chambers, room temperature, heat preservation, and low temperature. To ensure that customers are unable to receive products in time, fresh products remain fresh (Aćimović et al., 2020).

## 4.3 Green Cooperation on the Supply Side

On the supply side, cooperate with green suppliers, cooperate with green agricultural bases, and purchase green organic fruits and vegetables. In addition, packaging suppliers should also choose environmentally friendly packaging companies.

The materials for the packaging design of Fresh Hema's food are firstly, materials with natural ecological properties, such as bamboo and rattan, and secondly, artificial materials that reduce environmental pollution to a greater extent, such as kraft paper, corrugated paper, and non-toxic ABS plastic. In terms of packaging, suppliers try to choose green material companies, to ensure that the same ecological properties in the production and processing of materials, to facilitate secondary use, as well as packaging is easy to degrade after the final waste. At the same time, the geographical nature of packaging materials should be considered to achieve local conditions. Offline stores are mostly situated around the Yangtze River Delta, and Anji, Zhejiang Province, also located in the Yangtze River Delta region, is rich in bamboo, which is a natural material that can be recycled and naturally explained, and the promotion of bamboo instead of paper materials is conducive to the reduction of tree felling.

Improve the green recycling system based on the "5R" principle (Reduce, Reevaluate, Reuse, Recycle, Rescue) with a third-party organization, and propose more economical and environmentally friendly green

recycling and disposal solutions for various packaging boxes and residual agricultural products, such as recycling of bamboo boxes, making bamboo charcoal, expired fruits and vegetables can be recycled to make fertilizers, etc. to achieve green and sustainable development.

## 5 CONCLUSIONS

People's demand for environmental protection of enterprises is constantly rising, and how fresh food e-commerce platform conforms to the requirements of the environment and build a green supply chain has become extremely important.

This paper takes Fresh Hema as the research object, by introducing Fresh Hema's supply chain mode and green policy at the present stage to provide a reference for peer company and then analyzing the environmental protection problems that still exist at the present stage of Fresh Hema, analyzing and proposing solutions to them, and providing reference direction for Fresh Hema to build a green supply chain.

Fresh Hema's strong supply chain and new retail model have made it a great success. However, under the social background of pursuing environmental protection, Fresh Hema, as a head enterprise of the new retail fresh food industry, combines digitalization, intelligence, and supply chain, optimizes environmental protection from every link of the supply chain, and promotes the implementation of environmental protection policies and the construction of green supply chain, which can provide a reference standard for the whole industry.

However, the research in this paper relies on a literature review and case study, without involving original data, and the confirmation aspect is lacking. Future research can apply empirical analysis to analyze specific environmental indicators, use linear regression and other models to analyze the impact of different green supply chain measures on corporate environmental protection, and further expand the research related to the role of green supply chain construction on the promotion of new retail enterprises.

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