

Research on Green Supply Chain Incentive Strategy of Special Aquatic Products Led by Manufacturer

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Abstract

Water pollution and drug abuse are the pain points of the aquaculture industry. Green environmental protection is the only way for the aquaculture industry to solve these pain points. Because aquaculture is a weak industry, the implementation of green development needs various supporting policies. Because of its product category and the uniqueness of the supply chain structure, special aquatic products supply chain needs incentive strategy design from the supply chain and operation level in addition to ordinary green aquaculture support policy in the process of promoting green development. The incentive system for the green development of the special aquatic products supply chain has been established from three dimensions: the macro external environment, the cooperative relationship between enterprises, and the micro operation.

Keywords

Special Aquatic Products; Green Supply Chain; Incentive Policy.

1. Introduction

China has become the world's largest producer of aquatic products, but there are also many problems associated with it. First of all, the quality and safety of aquatic products has a certain hidden danger. According to the survey, 55% of consumers argue that the quality problem of aquatic products is serious, and consumer recognition is lower than the level of quality and safety issued by official(Zhang Jingyi, 2019). Secondly, aquaculture water pollution. The 2018 China's Fishery Ecological Environment Bulletin shows that the local pollution in China's fishery waters is still relatively serious, and the main pollutants are nitrogen and phosphorus. In the process of aquatic products breeding and circulation, the abuse of antibiotics and environmental pollution have put forward an urgent demand for the green development of aquatic products industry. Therefore, it is urgent to implement green development, control environmental pollution and improve the safety and quality of aquatic products.

In February 2019, the Ministry of Agriculture and Rural Affairs and 10 ministries jointly issued a document to accelerate the green development of aquaculture, develop green aquaculture is the future development direction of aquaculture, and the green development of aquaculture has a strong practical demand.

2. Green Supply Chain Incentive Mechanism

Since the concept of green supply chain management was put forward in the 1990s, it has gradually attracted the attention of governments and enterprises around the world. At present, green supply chain research is divided into two categories, one is manufacturer-led green supply chain research, the other is retailer-led green supply chain research, which is studied by domestic and foreign scholars.

Ghosh and Shah (2012) studied the price and greenness level of a secondary supply chain composed of retailers and manufacturers, and finally use a two-part contract model to achieve supply chain coordination. Wang Zaiping (2007) believed that the increased retailer concentration would help reduce social costs, thus limiting the supplier oligopoly, and thus increasing their own market share. Li Yanjun (2008) conducted a game analysis on supplier behavior on this basis and proposed the conclusion that retailers and suppliers tend to be non-cooperative low efficiency equilibrium in the retailer-led supply chain. Jin Changfei et al. (2012) built a Stackelberg model of both green products and ordinary products, introduced the government price subsidy mechanism, and compared the effectiveness of the government subsidy with the two incentive strategies based on the recovery rate or the recovery volume. Lin Ting et al. (2015) used the evolutionary game model to explore the knowledge sharing behavior of the upper, middle and lower supply chains of agricultural products. Zhang Dongdong, Wang Handong (2017) studied the supply chain system coordination problem composed of one manufacturer and one retailer in view of the situation that the demand is determined by the product green degree and the service level. Jiang Shiyong and Li Suicheng (2015) compared and analyzed the four supply chain game models considering the greenness degree of products, and achieved the supply chain coordination by using the revenue-sharing contract.

In the field of green supply chain coordination, the existing research has the following three characteristics. Firstly, the supply chain structure is mostly dominated by retailers, especially the agricultural products supply chain is generally dominated by retailers. Secondly, the coordination means to use government subsidies, recovery contract, income sharing contract, knowledge sharing and so on. Third, the decision variables include price, service level, greenness level and other concepts.

To sum up, the basic idea of the incentive mechanism research can be summarized as the following. First of all, build a green supply chain model consisting of producers, retailers and consumers, then, calculate the benefit distribution of each party, and then add the incentive mechanism in the model which includes the producers as the incentive subject and retailers as the incentive objects, calculate the benefit distribution in various incentive situation and the overall benefits in the supply chain, analyze the effectiveness of the incentive mechanism. For example, the proposed retailer can encourage suppliers' research and development of green aquaculture and processing process by adding marginal subsidy value (i. e., price subsidy) and undertaking part of the research and development expenses of green aquatic products breeding and processing process (i. e., transfer payment).

In the aquaculture industry, ordinary aquatic products because of the aquaculture technical requirements are not high, low industry threshold, many entrants, as long as there are water resources, you can enter this industry. Special aquatic products, because in seedling raising, immunization, feeding, water quality cultivation and other aspects need special treatment, need to master a certain aquaculture professional knowledge and skills and needs

In the aquaculture industry, ordinary aquatic products can easily enter the industry as long as there are water resources in the local place. Because of the low requirements for aquaculture technology, low barriers to entry, and many entrants. Aquaculture enterprises can not take the initiative in aquatic product supply chain collaboration. While special aquatic products need special treatment in many aspects such as seedling breeding, immunization, feeding and water quality cultivation, they need to master certain professional knowledge and skills of aquaculture, and they need to invest in special facilities and equipment. The cost will increase significantly, which increases the knowledge threshold and capital threshold of special aquaculture industry. However, there is no difference between the requirements of special aquatic products on dealers and those of ordinary aquatic products on dealers. Therefore, the

supply chain of special aquatic products is dominated by manufacturers, who play the leading role in the supply chain game of special aquatic products.

3. Design of Green Supply Chain Incentive Strategy System for Special Aquatic Products Led by Manufacturers

3.1. Policies and Regulations

Due to the problems in the green supply chain operation, such as manufacturer motivation, generation and intergenerational negative externalities, the information asymmetry and moral hazard problems, it is necessary to formulate corresponding green supply chain management policies and support measures, combining environmental review and quality supervision, improve the punishment standards for pollution sources and crackdown, from the green supply chain system.

3.2. Economic Incentive

Economic incentive is on the premise of sustainable development, based on the inseparable of economic and environmental policies, from the perspective of cost-benefit principle, by using certain economic means, to guide the green supply chain member enterprise behavior choice, fairly take the share of the loss of benefits caused by externalities, in order to build an incentive mode for mutual promotion among the enterprise individual interests, supply chain overall interests and social interests. Specifically, economic incentives mainly include sewage charges, product charges, deposit, repayment, buying and selling licenses, subsidies and so on.

3.3. Price Incentive

The relationship between various enterprises in the green supply chain is a strategic partnership, and the profits distribution of various enterprises in the supply chain is mainly reflected in the price, which includes the distribution of supply chain profits among enterprises. Reasonable pricing can enhance the enthusiasm of enterprises, and unreasonable pricing will hinder the enthusiasm of enterprises. The reasonable distribution of green supply chain profits is conducive to the stability and smooth operation of the cooperation between supply chain enterprises. The main body of price incentive is generally the upstream enterprises and superior enterprises, and the object is the downstream enterprises and inferior enterprises.

3.4. Information Sharing Incentive

In order to meet the changes of consumer demand, improve the flexible production capacity, knowledge management ability, innovation ability, cooperation ability of the green supply chain enterprises and adapt to the fierce competition situation in the global market, the green supply chain must implement information sharing. Access to companies in the supply chain to more information means that companies have more opportunities, more resources. The incentive of information to the supply chain essentially belongs to an indirect incentive mode, but its incentive effect cannot be underestimated. Information sharing can not only reduce the bullwhip effect, improve the overall profit level of the green supply chain, but also improve the level of compatibility of the member enterprise activities with the environment, and increase the welfare.

3.5. Green Cultural Incentive

Cultural incentive has developed into an important means of modern management. It is far from enough to implement the green supply chain only by using the compulsion or material incentives such as government regulation and economic incentive. When choosing strategic partners, enterprises in the green supply chain require their partners to not only meet the requirements of the supply chain, but also have a positive sense of environmental management.

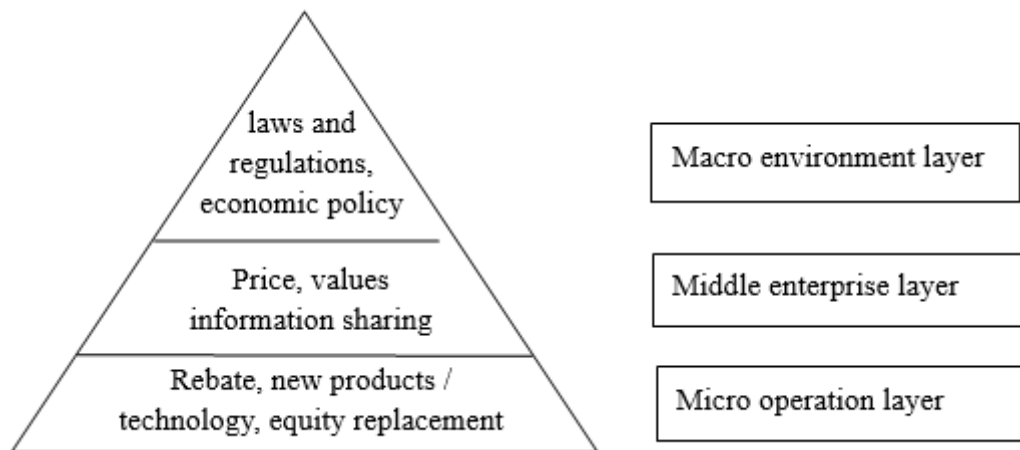


Figure 1. Green supply chain incentive tool for Special Aquatic Products

Table 1. Green supply chain incentive mechanism for special aquatic products

	Macro environment layer	Middle enterprise layer			Micro operation layer		
Tool	Regulations and economic policies	Price	Information sharing	Value	Rebate	New products / technologies	Equity replacement
Incentive subject	Government authorities	Production enterprises of special aquatic products	Breeding enterprises of special aquatic products	Supply chain node enterprises	Sales enterprise	Sales enterprise	Breeding enterprises of special aquatic products
Incentive object	Breeding and sale enterprises of special aquatic products	Sales enterprises of special aquatic products	Sales enterprises of special aquatic products	Supply chain node enterprises	Breeding enterprises of special aquatic products	Breeding enterprises of special aquatic products	Seller
Incentive target	Encourage related enterprises to carry out green operations	Increase orders and expand sales	Share demand information	Promote consistency in action through consistency in ideas	Promote breeding enterprises to control cost	Promote the progress of green breeding technologies	Encourage special aquatic product breeding enterprises and sales enterprises to form a community of interests

The green nature of the whole supply chain is achieved through the green procurement, production, transportation, packaging and distribution, recycling and waste disposal of various enterprises with environmentally conscious in the green supply chain.

As a common value system of all enterprises, green culture is the basis for good communication and coordination among the members of the green supply chain. It determines the attitude of enterprises and their employees towards environmental impact and resource utilization efficiency. The incentive of culture for green supply chain is mainly reflected in whether there is a positive sense of environmental protection, ecological protection and green management awareness, whether management functions can be integrated, and whether effective communication between member enterprises and within enterprises.

The green supply chain incentive system can be divided into three levels, namely, macro level, medium level and micro level. The detailed division is shown in Figure 1. The incentive policies at each level have the corresponding incentive subjects, incentive objects, incentive tools, incentive goals, etc. They constitute the incentive system as a whole, as shown in Table 1.

4. Summary

The construction of green supply chain of special aquatic products is not only solved by breeding enterprises independently, but also requires systematic design. The incentive policy design should be applied to the macro policy environment, the cooperation between enterprises, and the micro business links. The design of the incentive system should consider the consistency of the incentive policies at different levels to ensure that the incentive policies can support each other.

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References

- [1] Y. Zhang, Jie Chen, J.J. Liu. Characteristics of Chinese aquatic product consumption transformation and its enlightenment to fishery supply-side structural reform, Chinese Fishery Econom. No. 3 (2019), 8-14.
- [2] Ghosh D, Shah J. A comparative analysis of greening policies across supply chain structures, International Journal Production Economics, Vol. 135 (2012) No. 2, p. 568-583.
- [3] Z.P. Wang. Retailers' buyer power: welfare analysis and public policy, Journal of Shanghai University of Finance and Economics, Vol. 9 (2007) No. 4, p. 56-62.
- [4] Y.J. Li. Game analysis on corporate behavior of supply chain led by retailer, Journal of Huaiyin Normal University (Philosophy and Social Sciences), Vol. 30 (2008) No. 6, p. 756-758.
- [5] C.F. Jin, X. Wang. Analysis of enterprise decision-making and government incentive strategy in remanufacturing green supply chain, China Science and Technology Forum, (2012) No. 3, p. 74-80.
- [6] T. Ling, Y. Li, L. Zhang. Research on the evolution of knowledge sharing behavior among nodes in supply chain of food agricultural products, Research on Science and Technology management, Vol. 35 (2015) No. 18, p. 141-144+156.
- [7] D. D. Zhang, H. D. Wang. Supply chain decision-making and coordination of demand-dependent product greenness and service level, Frontiers in Social Science, Vol. 6 (2017) No. 2, p. 185-194.
- [8] S.Y. Jiang and S. C. Li, Green supply chain game model and revenue sharing contract considering product green degree, China Management Science. Vol. 23(2015) No. 2, p. 169-176.