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A New Advanced Logistics Supply Chain for Food Management Based on Green Logistics Theory

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Abstract: The study aims to investigate the advanced logistics supply chain for food management using green logistics. To protect the food logistics environment and prevent the environmental pollution, it is crucial to establish powerful modern supply chains to support the food management in transportation. The construction speed of the food companies is very fast; however, the food supply lags behind the food companies. As a result, the environmental pollution caused in the food logistics becomes severe. To improve this situation, a new logistics supply chain for food management using the environmental logistics theory is proposed in this study. The design and analysis of the proposed food supply chain system has been introduced. By the use of advanced environmental logistics theory, the food supply can be operated in an effective and green manner. Hence, the proposed new logistics supply chain can reduce the environmental pollution of the food logistics and improve the food market environment.

Keywords: Environmental logistics, environmental pollution, food logistics

INTRODUCTION

With the rapid development of food companies, the scale of the food supply chains become huger and huger. Dekker *et al*. (2012) High pressure has been put on the food industrial to control the cost in the equipment purchasing and food storage, maintenance and supply, etc. One of the most important issues in the food supply management is the environmental pollution. The environmental pollution caused in the food logistics processing nowadays cannot be ignored. According to the operational control of food security, it is crucial to control and reduce the environmental pollution on the key elements in the food logistics, by building a suitable and useful supply chain system (Lai *et al*., 2012). Fortunately, the Green logistics conception provides a theory basis to support the construction of such kind advanced logistics supply chain for food management.

The green logistics adopts the environmental logistics theory to control the logistics harm to the environment caused in the logistics process, implement the logistics environment purification and make full use of the logistics resources (Mishra *et al*., 2012). With great deterioration of the environment resources, the threat to human survival and development appears; so the environment and environmental protection obtain more and more attentions and the development of modern logistics must give priority to environmental issues (Huang *et al*., 2012). People's need from the perspective of environmental logistics system is improved and the need to form an environment symbiotic type of logistics management system becomes urgent. This kind of logistics management system based on the maintenance of the global environment and sustainable development will change the original development and logistics, consumer life and the logistics of a one-way relationship, as well as inhibiting the harm to the environment of logistics at the same time (Iannone, 2012). All of these effort aims to form a promoted healthy development of the economy and consumption logistics system, namely the green logistics. Therefore, modern green logistics management emphasizes the overall and long-term interests, emphasizes the all-round concern for the environment. It manifests the green action to the environment and hence it is a kind of new logistics management tendency.

However, the unified theory about the green logistics is not formed and the green supply chain for food logistics is not provided. The research and application of the green or environmental supply chain system for food logistics are still in an early development stage (Liu *et al*., 2013). How to develop and fuse the environmental logistics theory into the traditional food logistics management to establish a new modern logistics system has become a hottest topic in the field and the research findings will optimize the operation of food logistics, enhance the efficiency of the supply chain and reduce the environmental pollution (Liu *et al*., 2013). However, a solution to the green logistics is not formed for the food logistics and the related studies should be continued.

Therefore, in order to investigate the advanced logistics supply chain for food management using environmental logistics, this study has discussed the new green logistics supply chain to provide theoretical

basis for reducing environmental pollution and protect the environmental in food logistics. The analysis results show that the proposed green logistics supply chain could impel the development of the environmental logistics for food management.

MATERIALS AND METHODS

The green logistics theory consists of three sub-system theories, including the theory of sustainable development, ecological economics theory and ecological ethics theory (Elhedhli and Merrick, 2012).

The theory of sustainable development: The content of the theory of sustainable development includes the following aspects. First, it refers to the ecological sustainability. The ecological sustainability demands to change the simple pursuit of economic growth and ignore the traditional development mode of ecological environment protection, but pay attentions to maintain the integrity of the life support system and the biological diversity, protect and preserve the human atmosphere, freshwater, marine, land and forest and other natural resources from pollution. It demands active control and recovery the destroyed and polluted environment.

Second, it refers to the economy sustainability. The economic sustainability requires high and new technology development through the adjustment of industrial structure to transform the modern mode into economic growth. It also demands to improve the economic quality, optimize the economic configuration, save energy and reduce consumption, increase efficiency, implement clean production and civilized consumption, flow less hazardous waste and emissions and does not pose a hazard to future generations.

Third, it refers to the social sustainability. The society sustainability demands to improve the human quality of life, actively promote civilian society, fair, safe and healthy direction. So we must control population quantity, improve population quality, adjust social distribution relation reasonably and eliminate the inequality and polarization. We also need vigorously develop education, culture and health care, to improve the quality and health of all the people, as well as scientific and cultural level. Then, establish and perfect the social security system to keep social political stability. Thus, sustainable development is neither a single refers to the economic development and social development, nor it is a single refer to the ecological sustained. It is ecological-economic-social sustainable in a three-dimension system. In the sustainable economy, sustainable ecologic and sustainable society system, the basis is the ecological sustainability, the leading is the economic sustainability and the fundament is the social sustainability. Sustainable development applied to the modern logistics activities, is the requirement of modern logistics from the perspective of environmental protection, to form a symbiosis with the environment of the integrated logistics system, change the original one-way function relationship between logistics and economic development and restrain logistics cause harm to the environment. At the same time, it forms a kind of healthy development of the economy and consumption life of modern logistics system. All of these create a brand new concept of "green logistics".

The ecological economics theory: The ecological economics theory refers to the science of reproduction process, economic system and ecological system between the logistics cycle, energy cycle and values of law and their applications. Logistics is an important part in the process of social reproduction and in the process of logistics there is not only material recycling and energy conversion, but the realization of the value. Logistics involves, therefore, economic and ecological environment system and reasonably sets up bridges between the economic benefit and ecological benefit. The economic benefits are more closely related to current and local interests, while environmental benefits relate to macro and long-term interests. Both the economic and environmental benefits are the unity of opposites. The latter is natural source base and material and the former is the economic performance of the latter. Green logistics adopts the general principles of economics as guidance, to research the relationship between the economic behavior, economic relationships and laws and the ecosystem in the logistics processing to seek the best combination of ecology and economy and the coordinated development in the ecological balance.

The ecological ethics theory: The ecological crisis forced people to reflect on their behavior and endure the moral responsibility to the ecological environment. This has prompted the emergence and development of ecological ethics. Ecological ethics is from a moral point of cross discipline between people and nature based on the ecology of regularity of interaction between mankind and nature. By means of morality, the ecological ethics coordinate the relationship between human and natural environment. Ecological ethics is forcing people to profound reflection of environment problems in logistics, which leads to a strong sense of responsibility and obligation. In order to leave immediate interests to the future generations, more health and safe for human survival and development, human should maintain the ecological balance.

Figure 1 shows the theory structure of green logistics.

The proposed method: In this study, the green logistics is employed to establish the food supply chain system. The food supply chain system includes material

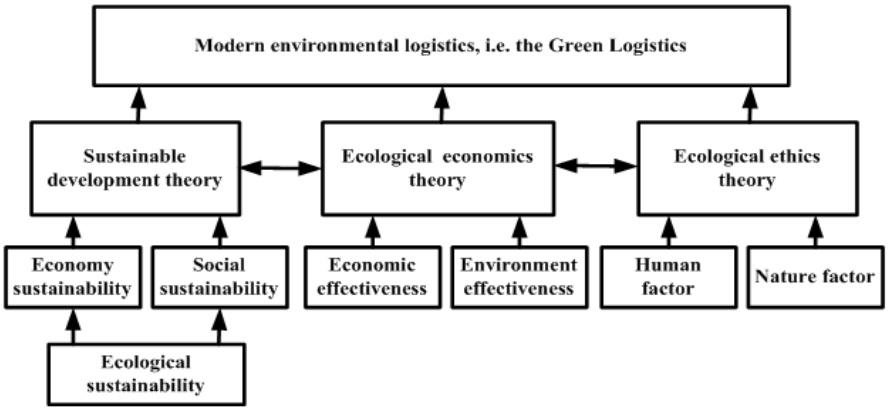

Fig. 1: The green logistics

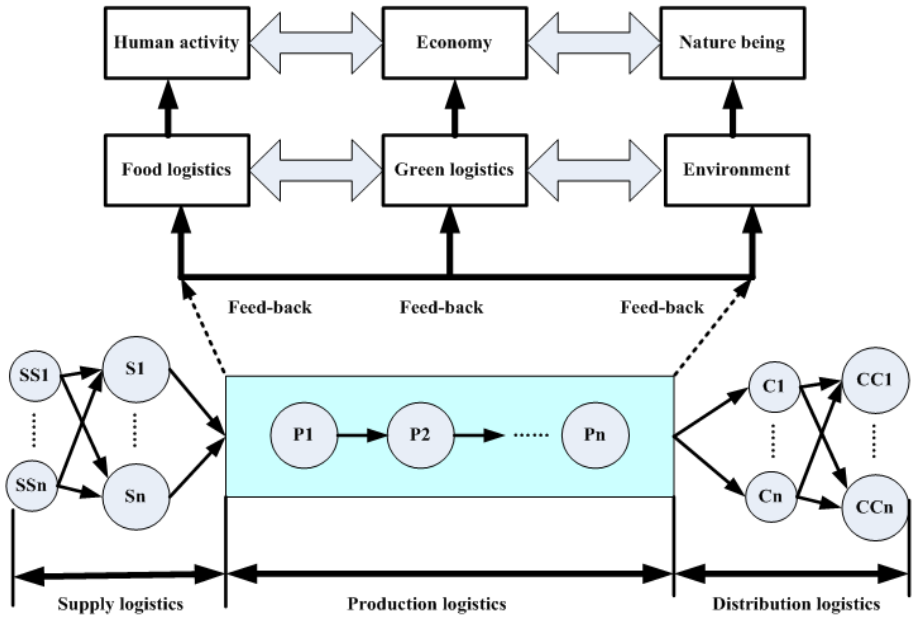

Fig. 2: The proposed green logistics for food supply chain system

and information flow, from the food manufacturers and food companies, to the food distributors and sellers (Kumar *et al*., 2012). The purpose of the green logistics is to manage the food logistics processing to control the environment pollution. To promote green logistics in addition to strengthen the food management, it should pay attention to the green consciousness and give play to the role of food companies in the field of environmental protection. Thus form a kind of self-discipline of the green food logistics system.

Figure 2 shows the proposed green logistics for food supply chain. The food supply chain management uses the internet information to manage the food transportation, storage, distribution, etc. It keeps supply chain in the friendly environment and hence decreases the environment damage level. The food supply chain includes the supply logistics and the information between supply chain and environment (Kumar *et al*., 2012). Therefore, the green logistics theory connects the food logistics with the environment management to establish a clean and friendly modern food logistics management system. The proposed green logistics for food supply chain integrates the food companies, human and nature into a whole flexible management system to improve the green logistics ability. As a result, the environment pollution caused in the food logistics can be depressed to the green level.

RESULTS AND DISCUSSION

Green transportation management:

- **Carry out joint distribution:** The joint distribution refers to the distribution of joint implementation by multiple enterprise activities. A few small and medium-sized distribution centers

unite to serve customers in a region distribution. The joint distribution can be divided into to two types, i.e., the shippers as the main body of the joint distribution or the logistics enterprises as the main body of the joint distribution. From the point of view of the owner, the joint distribution can improve the efficiency of logistics. Such as the small and medium-sized wholesale, their distribution is difficult to meet retailers' small batch delivery requirements. By joint distribution, the delivery can implement a few distributions and the receiving party can make unified inspection so as to achieve the aim of improving logistics service level. From the perspective of logistics enterprises, especially some small and medium-sized logistics enterprises, due to the restriction in capital, talent and management of the vehicle capacity, the logistics rationalization and efficiency would be restricted. If cooperate with each other through joint distribution, then these problems can get a better solution. As a result, the joint distribution can maximize the efficiency of personnel, goods, capital, time and other resources, to achieve maximum economic benefits. At the same time, it can remove redundant staggered transport and enhance environmental protection and other social benefits.

- **Adopt composite transportation mode:** The composite transportation refers to the drain railways, automobiles, ships and aircraft, etc. It combines the advantages of basic transportation modes to implement more links to join each other to transport goods. This kind of transportation mode uses the containers as the general medium to link various transportation tools. Therefore, the loading tools and package sizes will be standardized. Because of using full containers, it can reduce the packaging costs and avoid the damage in the transport process. The advantages of composite transportation mode also displays in:
  - Overcome the inherent shortcomings in a single mode of transportation to ensure the efficiency in transport process.
  - Solve the space and time separation of goods in the production and marketing due to differences in geography, climate, infrastructure construction and other market conditions to promote the effective operation of the enterprise production and operation.
  - **Develop the third party logistics:** The third party logistics provide logistics service outside the supplier and the buyer. By developing third party logistics, these specialized logistics enterprise can provide logistics services to the supplier or the buyer from a high perspective. Then it will solve the logistics problems, simplify the distribution link and transportation and realize rational utilization and allocation of logistics resources in a wider scope. More importantly, it will relieve urban pollution. In some big cities their traffic distribution is saturated, the professional logistics enterprises can reduce the volume of the carrier so as to relieve the pressure on the logistics of the urban environment pollution. In addition, enterprises should use various transport tools to save resources and reduce environmental pollution. The liquefied gas, solar energy and other clean energies could be used as new driving power resources.

Green packaging management: The green packaging refers to packing with resources saving and environment protecting. The green packaging mainly includes simplified production packaging and biodegradable materials. In the process of circulation, effective measures should be taken to realize the rationalization and modernization of packaging:

- **Modular packaging:** Standard packaging size. When the packaging modulus standards are determined, all kinds of products will be packed under required modules before flowing into the circulation. The modulus packaging can unify the size in warehouse facilities and transportation facilities and hence good for transport and storage.
- **Large-scale and unitized packaging:** It is advantageous to the logistics system in handling, removal, storage and transportation process, speeds up logistics operation and is beneficial to reduce unit packaging, packaging materials and packaging cost. It is also conducive to protect the cargo body.
- **Recycle packaging:** Multi-used and repeatedly used bags and scrap processing. By using generic packaging, it does not need to specially arrange return use. The recycle packaging can be repeated use, such as soft drinks and beer cans and can be turned after simple treatment. Waste packing materials after the regeneration treatment can be converted to other materials.
- **Development of new packaging materials and packaging equipment:** It aims to design high functional packaging equipment and develop new material in a variety of functions.

Green circulation: Circulation processing refers to goods from the producer to use. According to the need to packaging, segmentation, measurement, sorting, assembly, price and brand label, commodity inspection, etc., the circulation contains all of these operations. Circulation processing has strong productivity and has much room for the environmental protection. Green circulation processing measures mainly include two aspects. One focuses on the growing professional machining, adopts scale operation ways to improve efficiency of resource utilization and reduce environmental pollution. For instance, the catering services focus on food processing in order to reduce the energy consumption and air pollution from scattered

family cooking. The other is focus on waste centralized processing. To reduce pollution caused by scattered consumer waste, the circulation department can adopt centralized processing for vegetable waste to reduce scattered residents trash and solve corresponding environmental governance problem.

Green management on waste material: From the environmental point of view, in the future the mass production and consumption will produced a large amount of waste. Although many measures has been taken to accelerate the waste treatment and control waste logistics, the emergence of a large number of waste still has a serious negative impact on society, leading to difficulties in waste management and social resource depletion and natural resources deterioration. The logistics activity, therefore, must be beneficial to effective utilization of resources and maintain the earth's environment.

Waste material logistics refers to the items lost their original use value in economic activity. According to the actual need for collection, classification, packaging, storage and distribution, waste material flow into the special processing entity. Waste material logistics is the function of, ignoring the value of the object, only the environmental protection. In order to reduce waste material logistics, it shall establish a waste recycling system, including production, circulation and consumption. To achieve these objectives, companies can not only consider their logistics efficiency, but from the angle of the whole supply chain logistics, they must consider waste recycling logistics.

CONCLUSION

Since the society requires environment protection in the food market, it requires the food enterprise exploring new competitive logistics from the green point of view. The green logistics supply chain system can reduce the environment pollution in the logistics activities. In this study a new advanced supply chain system based on the green logistics is proposed for the food logistics. The proposed logistics supply chain system can be set up in comprehensive consideration of four aspects which involve green transportation management, green packaging management, green circulation and green management on waste material. Based on this new food logistics system, the environment pollution will be relieved greatly and hence the food logistics efficiency will be improved significantly.

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