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Operation Mode and Optimum Design of China's Agricultural Modern Logistics System

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Abstract Using comparative analysis and logical reasoning methods, in combination with traditional logistics theory and practice, and on the basis of objective demand of modern agricultural development for logistics service, we analyze features of logistics function. Besides, we discuss functional elements and service contents of agricultural modern logistics. In addition, we explore innovation model of agricultural modern logistics and systematized operation of supply chain. Finally, it is concluded that logistics development shall bring into full play all functional elements and achieve high efficient operation of the system through enhanced management measures.

Key words Agricultural modern logistics, Functional elements, System optimization

The rapid development of modern agriculture not only expedites the emergence of more vigorous demand for logistics service, but also requires the logistics functional elements in more extensive, intelligent and systematized operation to match up with such demand. Therefore, the logistics serving the modern agriculture must be "agricultural modern logistics", or specifically the logistics equipped with materials and supported by information technology on the modern agricultural service platform^[1]. However, the diversity and systematization of modern logistics functions as well as the standardization, coordination and efficient exertion in the operation of various activity elements absolutely depend on the management.

1 Analysis for functional elements of agricultural modern logistics

The major differences between the agricultural logistics and urban industrial and commercial logistics are as follows: firstly, the attribute and range of rural logistics resources are agricultural means of production (hereinafter referred to as "agricultural means") and agricultural products and their finished products; secondly, the functional elements of agricultural modern logistics are relatively more complicated, therefore, the logistics activity is more frequent and the difficulty in management is greater.

1.1 Functional elements of logistics The modern logistics is different from the conventional logistics, and an important difference mark lies in the functional elements and activity ranges of logistics service. The conventional logistics is a combination of "independent logistics" and "enterprise logistics" (internal material supply, transportation and warehousing), which belongs to the concept of physical distribution. Its functional elements roughly include transportation, purchase and supply,

distribution, distribution processing, packaging, warehousing and information service, which are called "seven functions" of logistics in the academic circle. The modern logistics is the business logistics developed and formed on the basis of conventional logistics. Its functions not only include the original seven elements, but also continue to extend to both ends: the starting point of logistics really breaks through the limits of direct service for production and circulation and derives the service of "information function" that promotes the full realization of logistics activity indirectly; the terminal point of logistics then surmounts the final consumers and extends to the unsold commodities, problem products and rejection and recovery after the consumption of commodities, forming the "recovery logistics"^[2].

1.2 Functional elements of agricultural modern logistics

The kernel business of China's rural logistics during the planned economic period is transportation, warehousing and purchase; with the implementation of a series of national preferential agricultural policies and the quickening of new socialist countryside construction, the rural infrastructures are greatly improved, the farmer cooperative organizations emerge in a large amount, the development patterns of modern agriculture and modernized big agriculture are formed preliminarily, the agricultural scale and industrialization are strengthened increasingly, the range of logistics demand is enlarged continuously, and thus the opportunity for developing the modern agriculture and agricultural modern logistics becomes mature increasingly. In the centralized districts and main producing regions of many agricultural products, the warehousing, sorting and packaging of professional logistics organs appear, even some professional logistics companies also organize the sales business of new, excellent and special agricultural products and the recovery of professional packages and recycled wastes selectively; when the information technology is widely spread and used in China, the information control is firmly embedded in the logistics service system and becomes a very important functional element of modern agricultural logistics. Thus, the modern agricultural logistics passes on and continuously breaks through the rural lo-

gistics functions, develops some new functions suitable for demands of modern agricultural construction and forms twelve functional elements of agricultural means and agricultural products such as purchase, supply, warehousing, transportation, loading and unloading, sorting, packaging, distribution, distribution processing, sales, recovery and information control,

etc., which are called "twelve functions of agricultural modern logistics". Four big logistics management system are established, including "purchase and supply logistics for means of production", "agricultural production logistics", "sales logistics for agricultural products" and "recycling and recovery logistics", shown in Fig. 1.

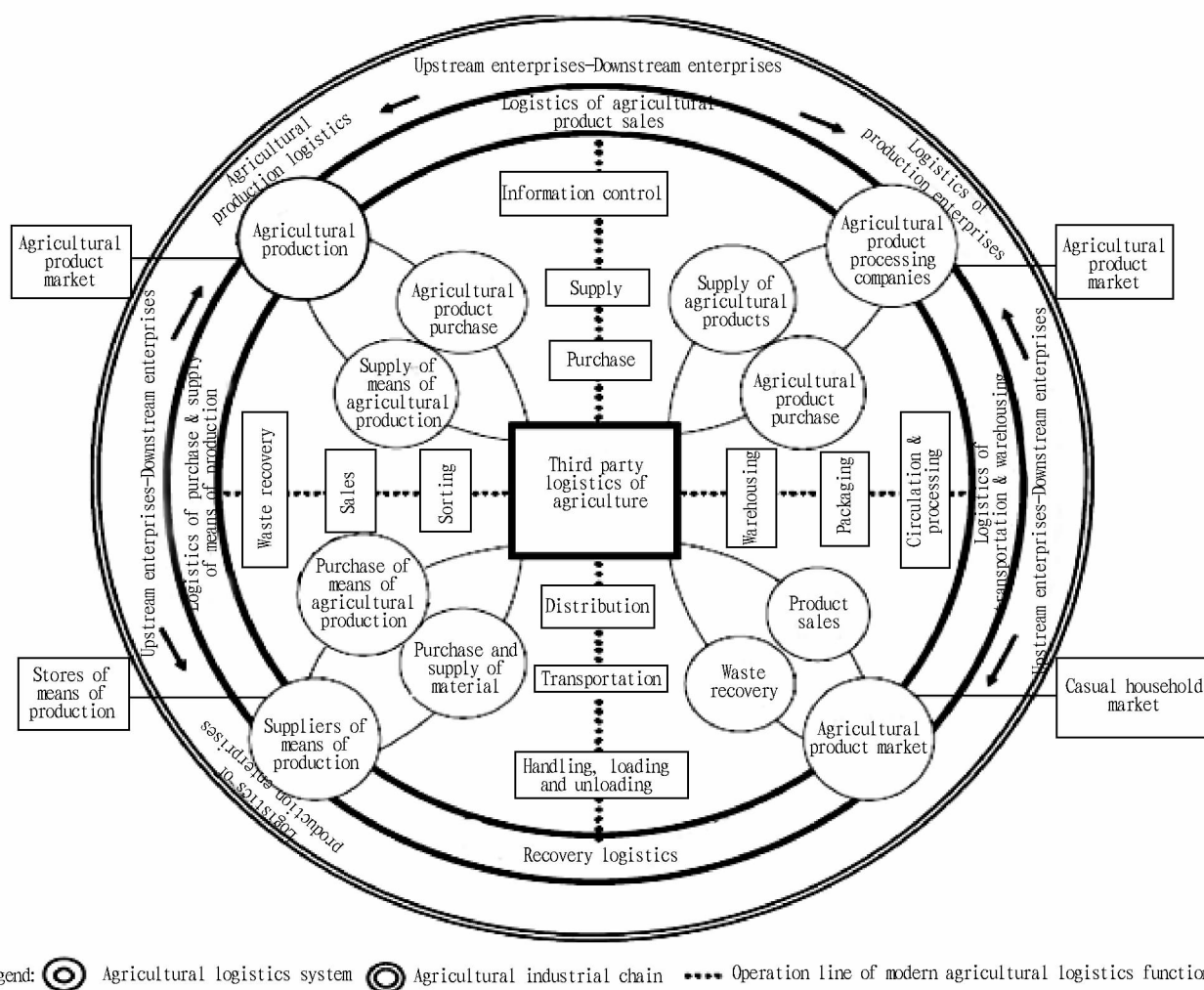


Fig. 1 Operating mode of modern agricultural logistics and supply chain

2 Agricultural modern logistics and systematized operation mode of supply chain

2.1 Functions and operation mode of conventional agricultural logistics

At the present stage, China's rural logistics is still the conventional logistics. It has comparatively single service functions, which are broken down and operated in different professional departments mostly and belong to the loose structural mode in separation operation. The stores for various means of production unifiedly purchase and sell seeds, pesticide, chemical fertilizer, fodder and agricultural appliances, *etc.* according to professional division of labor; the farmer households and family farms purchase, store and use the agricultural means independently or the farmer cooperatives and farm material departments unifiedly purchase and sell the agricultural means on behalf of them, and the logistics companies

also unifiedly purchase, supply and transport a small part of agricultural means; the sorting, packaging and sales of agricultural products are organized by the farmer households and family farms independently or jointly or arranged and sold by the farmer cooperatives, and the sales business is also carried out through the cooperation with logistics companies in a few districts; part of the transportation for purchase and sales is solved by the farmer households and family farms with transportation conditions independently, and part of it is undertaken by the logistics companies. It is shown that the agricultural logistics in the actual life basically appears as the "production logistics". The third party logistics undertakes the conventional functions such as transportation, commissioned purchase, loading and unloading, distribution, warehousing, *etc.* Basically, its basic mode appears as: conventional agricultural logis-

tics = transportation + distribution + commissioned purchase of agricultural means and equipment + loading and unloading.

In this mode, the logistics industry takes transportation and distribution as profit source of the third party, with commissioned purchase, loading and unloading as the second. Warehousing is set up basically for centralized distribution and transportation services, so there is nearly no professional warehousing business. Functions of agricultural logistics are incomplete, and professional supply, sales and recovery do not exist. What's worse, information is just a simple concept, so it is difficult to form the effect of upstream and downstream supply chain on agriculture.

2.2 Connection mode of modern agricultural logistics and supply chain Along with development of agricultural economy and scientific and technological progress, the modern agricultural logistics becomes gradually professional, coordinated, systematized and informationized. Land reclamation and cultivation and local professional logistics appear one after another. Agricultural production gradually moves towards the road of "service outsourcing". In this situation, it produces strong industrial chain effect on downstream agricultural enterprises. Finally, it forms the systematized and coordinated development mode of supplier of means of agricultural production → agricultural production → agricultural product processing → terminal market of agricultural products → third party logistics enterprises → supplier of means of agricultural production. The model is as follows:

Agricultural supply chain = (suppliers of means of agricultural production + agricultural producers and agricultural product processing companies + agricultural product and finished product sellers) + logistics providers.

Under the dominance of modern logistics system, agricultural production constitutes an interconnected and interdependent open circular industrial chain together with upstream suppliers and manufacturers of means of production, downstream agricultural product processing companies, as well as interdependently agricultural product market. All parties have both customer relation and supplier relation, while this circle of industrial chain and all industrial relations should be established and distributed on a relatively independent logistics circle. Materials and semi-finished goods for agriculture and processing industry are purchased, stored and supplied by logistics companies, whose product sale is also completed by downstream market supply through "repurchase" of logistics companies. Diversity of demands of rural logistics and multiple market selection contribute to "open type cycle" of agricultural logistics and supply chain circular system^[3].

3 Operation of modern agricultural logistics system and strategies for optimum management

3.1 Set up rural cooperative organizations To reduce costs of modern agricultural logistics and improve operational efficiency, agricultural logistics companies should strengthen functional distribution, and provide unified warehousing, pur-

chase, supply, loading and unloading, transportation, sorting, packaging, sales and recovery services. When it is necessary for producers to sort packs, agricultural logistics companies should provide proper fund subsidy and facilities, to reduce agricultural operational costs and risks. At the same time, it is required to reduce "one to one" service for farmer households. Township government should encourage administrative villages or neighboring natural villages to set up farmers' cooperative organizations. These organizations may exercise functions of purchase of means of agricultural production and agricultural products, bidding of the above logistics subjects, statistics of resources, cost settlement, and distribution of sales payment.

3.2 Strengthen construction of logistics informationization for industrial chain sections Agricultural logistics resources have strict fresh keeping and refrigeration control requirements for temperature, humidity, ventilation and closeness of storage and transportation, and some fresh products have higher requirements. Logistics companies should strengthen construction of informationization project, to facilitate monitoring and management during warehousing and transportation. Storekeeper is responsible for monitoring status of the entire warehouse through a computer; supercargo can observe and regulate temperature, humidity, air flow, and air pressure in cargo body at any time; logistics center can know well advancing and stopping places of vehicle or vessel and fatigue status of driver with the aid of GPS^[4]. In addition, it is required to establish multi-channel information source to collect dynamic data of customers, and master information of all parties' selling market environment, commodity and product consumption status, residuals and wastes with reproduction function and recycling value, and return cargo source. Function of recovery logistics, on one hand, can recover recyclable agricultural product packages to production department, which can promote reduction of agricultural production cost, increase resource utilization efficiency and accelerate construction of environmental protection. On the other hand, it can return logistics cargo source, increase logistics income and avoid high-cost operation of single course logistics service.

3.3 Adhere to standardized procedure control of logistics service We should establish standardized procedure control, to ensure healthy, orderly, and high-efficient operation of every logistics activity. This is the primary task of internal control and management in logistics industry. Strict contractual management is a basic procedure requirement for internal control of modern agricultural logistics. When providing purchase, supply and sales services, logistics companies should prepare purchase and supply contract on the basis of demand plan and statistics report submitted by farmers' cooperative organizations, teams and agricultural product processing enterprises. Later, they will carry out purchase, arrival acceptance and warehouse entry and storage, and take necessary sorting, packaging, and simple processing, to facilitate supply. According to time, type, specification and quantity required by agricultural production and agricultural product processing, logistics companies transport goods to corresponding departments or

places and deliver to farmers and enterprises. If agricultural units and agricultural product processing enterprises need to reach an agreement on purchase and sales matters or cargo distribution, transportation and supply at interdependently developed market with logistics companies, it is required to sign cooperative contract. After products are received, manufactured or processed, logistics companies purchase warehouse entry facilities, take necessary sorting, packaging or changing package, arrange distribution and transportation, organize sales, or deliver and supply products for designated market or demanded places as per production plan^[5].

4 Conclusions

The agricultural modern logistics shall have twelve functional elements, including the purchase, supply, warehousing, transportation, loading and unloading, sorting, packaging, distribution, distribution processing, sales, recovery and information control, *etc.* for logistics resources in rural areas. The tasks of agricultural modern logistics management shall be not only based on the reduction of logistics cost and reduction and stop of operation risks in logistics, but also study and help various functional elements of logistics to systematically, coordinate, efficiently bring into full play their comprehensive functions, to maximize "third party profit" of logistics industry, and

become power source of sharing agricultural risks, reducing costs of agricultural production, increasing agricultural economic benefits and promoting increase of farmers' income. Besides, we should put forth effort to closely connect upstream and downstream industrial chains, bring into full play function of government in promoting modern agricultural logistics and in construction of agricultural industrialization. Finally, we should stress the popularization role of informationization tool in development of logistics industry.

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