

Research on Agriculture Logistic Cost Based on Value-chain

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Abstract—This paper firstly introduce the basic situation of agricultural logistic and its cost, and describe the traditional agricultural logistic process in China. We avoid to discuss the agricultural logistic cost from the accounting, and put emphasis on cost counting and cost control on the basis of value chain. From the whole logistic activities, we use activity based costing to discuss how to decrease agricultural logistic cost.

Key words-agriculture logistic cost; value-chain; cost counting; cost control

1. Introduction

China is a big agricultural country. It is essential to set up modern logistic system in country in order to improve agricultural comprehensive competitive power. It is recognized that agricultural logistic plays an important role in the development of national's economics. But at present, because of huge amount of agricultural materials and products, dispersive supply and high logistic cost, the price of agricultural products are on the high side. Hence, if we can decrease agricultural logistic cost, advance efficiency of logistic activities and improve logistic service, it will not only enhance competitiveness of our agricultural products in the international market, but also increase farmers' income.

In China, the study on the agricultural logistic cost is still in the start-up period. Most of them analyse cost counting of agricultural logistic from the view of accounting. These research focus on the surface to study the reason of high agricultural logistic cost and the countermeasures to decrease the cost.

This paper has 3 further sections. Section 2 outlines the basic meaning and Chinese current situation of agricultural logistic and agricultural logistic cost. Section 3 details the composition of agricultural logistic cost. Section 4 discusses the cost counting and cost control of agricultural logistic cost base on the value chain.

2. Value-chain of AGRICULTURAL LOGISTIC

2.1. Agricultural Logistic

Agricultural logistic refers to physical flow of agricultural products from production to consumption to achieve agriculture products' value in order to satisfy customers' demand. And it includes production, purchasing, transportation, storage, loading and unloading, carrying, packing, distribution, processing and information activities. Value added of agriculture products are enforced in this process. In China, agricultural products are produced by scattered farmers, then they transport to their local market, and next to distribution market, finally distribute to consumer, as showed in Figure.1. It is typical wholesale style which has disadvantage of complex process and high circulated loss rate.

2.2. Particularity of Agricultural Logistic

1) In Production Phase

Agricultural production is seasonal and long production cycle with large discrepancy in different areas and natural conditions. In addition, it is prone to be affected by uncertain factors, such as insect pest, natural

calamities. These particularities of agricultural production influence organization and manage of agricultural logistic and make it face to diversity risks.

2) *In Packing, Processing, and Storage Phases*

With wide range, different shape and size, effective preserve condition of agricultural products, it requires that agricultural logistic should follow various different standard and use many kinds of special equipments in packing, processing and storage phases. Furthermore, it also has high requirement in freshness and quality control of agricultural products, then it causes high logistic operation cost.

3) *In Distribution, Retailing and Consumption Phases*

Most agricultural products are closely related with our living, they have small consume elastic. But since there are high substitutability between the same kind of agricultural products, consumer have limited loyalty to one agricultural products, it is easy to cause demand fluctuation in the market, and then bring Bullwhip effect in the supply chain. Distribution and retailing will be affected by these changes. So, customers will put forward higher requirements to quality and additional value to the agricultural products if the production exceeds demand in consumption phase. Government and firms should pay more attention to implement of agricultural products admittance system and application of quality detection and track technology, then it makes agricultural logistic transfer to closure and traceability operation model. Moreover, market circulate radius of agricultural products are restricted by fresh, regional and seasonal features, in the agricultural market in different

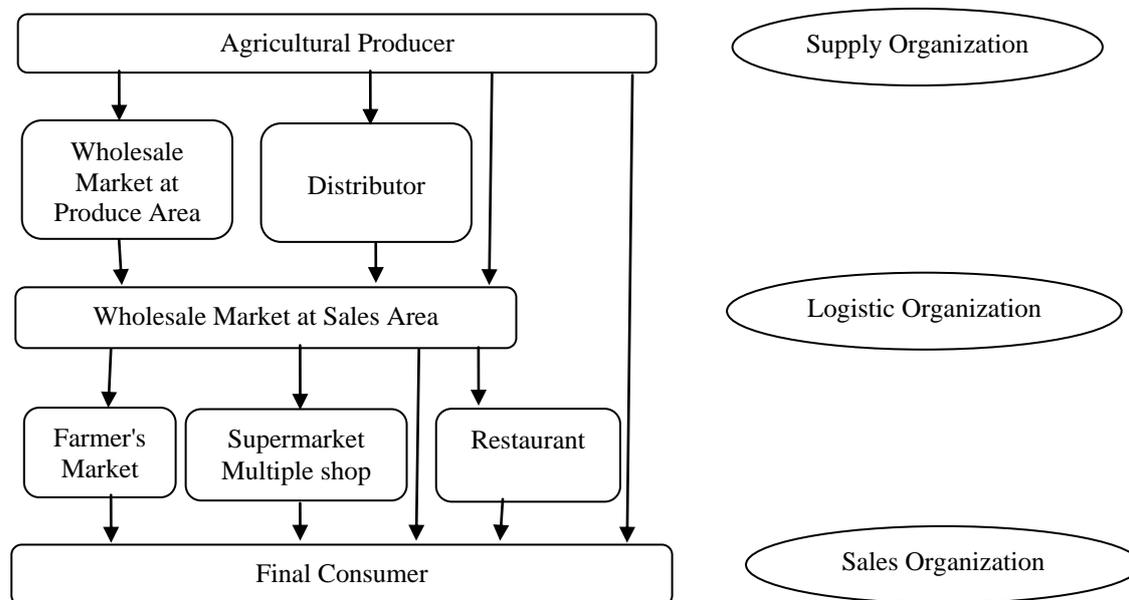


Figure 1 China's Traditional Agricultural Logistic Process

season and region only can sell seasonal products, that means agricultural market are splitted. So it makes storage technology and equipment related to cold chain logistic and distribution, retailing process become more important.

2.3. Value-chain of Agricultural Logistic

Agricultural logistic is a systematic engineering, it integrates the purchase, wholesale, retail and other phases before consumption to be a system and put emphasis on harmony and supporting service among phases. This system is a value chain with partial value activities. Agriculture's value are determined by two parts: forward value added and negative value loss, and its additional value is realized through all phases of logistic which transfer agricultural products from production area to consumption area. All phases of agricultural logistic are activities generated additional value and all knots are working point which change value.

3. AGRICULTURAL LOGISTIC COST

3.1. Components of Agricultural Logistic Cost

1) Direct Cost

It refers to the currency performance consumed in the process of production space shifting, it is sum of labour power, material resource and financial capacity which occurred in the movement of packing, loading and unloading, transportation, storage and logistic information. So it mainly includes transportation cost, warehouse charges, circulation processing cost, landed cost, packing cost and distribution cost.

2) Indirect Cost

This part is related to transport effects, it includes inventory risk cost, provision-value decline loss, inventory capital-occupied cost, logistic waste and inventory loss.

3) Transaction Cost

As same as other types deals, it does not matter logistic are provided by either firms themselves or market, it involves transaction cost. If it is the outsourcing logistic, both logistic demand and supply party should not only focus on direct and indirect costs of agricultural logistic. Because transaction cost not only improve logistic transaction charges, but also lead to higher direct and indirect costs of agricultural logistic. With more deepen of division, it has become the most important factor to influence agricultural logistic efficiency.

Transaction cost refer to charges or the prices which payed to make the transaction go smoothly in the process of looking for transaction object, signing, supervising and execution of the contract. There are three factors to determine the transaction cost of agricultural logistic: asset specificity, uncertainty and transaction frequency.

Generally speaking, china's agricultural logistic cost are shown in Figure 2.

3.2. Analysis on Cost Driver of Agricultural Logistic Cost

Cost driver refers to the reason which cause cost occur. It is precondition and basis to get clear cost driver for cost management. From the point of cost drive, on the basis of considering internal connection and integration, value chain stress on opportunity of cutting cost through coordination and optimization.

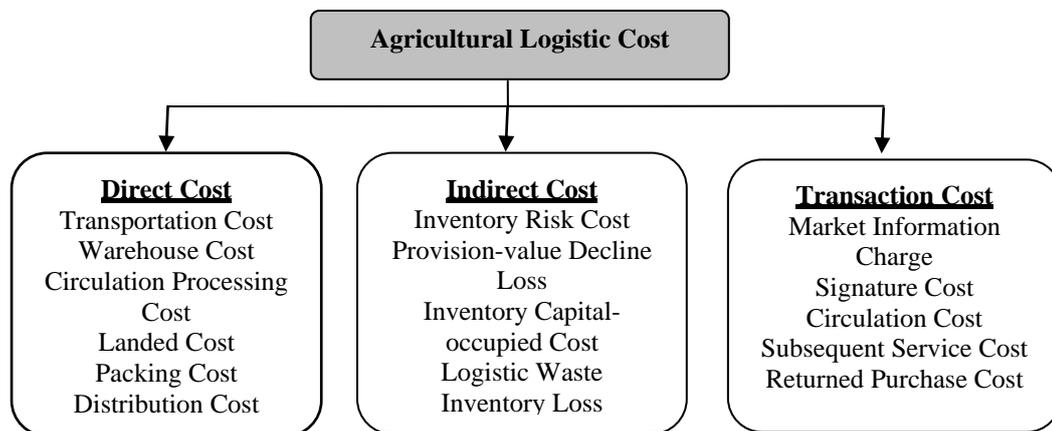


Figure 2 Agricultural Logistic Cost in China

4. OPTIMIZATION OF AGRICULTURAL LOGISTIC COST BASED ON VALUE-CHAIN

As shown in Figure 2, agricultural logistic cost consist of Transportation Cost, Warehouse Cost, Circulation Processing Cost, Landed Cost, Packing Cost and indirect cost, transaction cost. Activity based costing can be used to accounting agricultural logistic cost according to cost driver, which not only improve

accuracy of logistic, but also provide complete and reliable basis for the whole value chain of each activity's logistic cost management.

4.1. Counting of Logistic Cost Based on Value Chain

From the activity based costing, agricultural logistic cost is the sum of each activity's cost which spread over logistic chain. Based on the point of value chain, cost should be counted from the whole value chain. So, agricultural logistic cost classify according to logistic activities, then assign resources used in the logistic into each activity. Finally, we confirm cost driver, then assign activity cost into every cost item. Generally speaking, there are totally 3 steps to effect activity based costing.

1) Division of Activity Cost Pool

Agricultural logistic involves many kinds of activities, such as packing, storage, loading and unloading, transportation, circulation processing, distribution. Effective classified method should be used to avoid high logistic costs. The most common way is to classify some activities into activity centers which related activities belong to one center. This center is the collection of these related activities, and it provides cost information, resource information consumed in each activity and execution information.

Suppose there are m kinds of agricultural products, the quantity of logistic activities throughout the process of agricultural products is n, and the activity matrix is X.

$$X = \begin{pmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} & \dots & \alpha_{1n} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} & \dots & \alpha_{2n} \\ \dots & \dots & \dots & \dots & \dots \\ \alpha_{m1} & \alpha_{m2} & \alpha_{m3} & \dots & \alpha_{mn} \end{pmatrix}$$

X represents the quantity of logistic activity which is consumed by m kinds of agricultural products, row vectors $[\alpha_{i1} \ \alpha_{i2} \ \alpha_{i3} \ \dots \ \alpha_{in}]$ represent the quantity of the 1 to n kinds of logistic activity which is consumed by the ith kinds of agricultural product, meanwhile column vectors $[\alpha_{1j} \ \alpha_{2j} \ \alpha_{3j} \ \dots \ \alpha_{mj}]$ represent the quantity of the jth logistic activity which is consumed by each kinds of agricultural products.

2) Confirmation of Resources Related to Logistic System

Similar with other kinds of logistic, resources consumed in the agricultural logistic consist of labour, material, maintenance cost (like salary), indirect fees and other charges. When we confirm resources, we have make sure that all resources are closely related to the logistic activities, and irrelevant resource are omitted from the cost counting.

Let suppose that the quantity which jth logistic activity consume sth resource is δ_{jn} ($n=1,2,\dots, s$), and the cost of sth resource is C, variable cost of mth agricultural product is V. So now we get the following matrix.

$$Y = \begin{pmatrix} \delta_{11} & \delta_{12} & \delta_{13} & \dots & \delta_{1s} \\ \delta_{21} & \delta_{22} & \delta_{23} & \dots & \delta_{2s} \\ \dots & \dots & \dots & \dots & \dots \\ \delta_{j1} & \delta_{j2} & \delta_{j3} & \dots & \delta_{js} \end{pmatrix}$$

$$C = \begin{pmatrix} c_1 \\ c_2 \\ \dots \\ c_s \end{pmatrix}$$

$$V = \begin{pmatrix} v_1 \\ v_2 \\ \dots \\ v_s \end{pmatrix}$$

Where row vector $Y [\delta_1 \delta_2 \dots \delta_s]$ stand for the volume which j logistic activity consume the resources from 1~s.

3) Total cost of Agricultural Logistic

Logistic cost of agricultural products is the sum of all needed logistic activities, meanwhile, activity cost equal to consumed resources times by price of resources. So, according to the theory of activity based costing the total cost of agricultural logistic

$$TC = X \times Y \times C + V$$

4.2. Cost Control of Agricultural Logistic Based on Value Chain

In the actual study, counting and control of agricultural logistic cost is a entire system. Cost counting is the precondition of cost control. Cost information provided by activity based costing offer an approach to recognize the value chain. As we know, for the agricultural logistic, it is also important to put more attention on logistic cost control based on value chain. So, optimization of value chain could be done from the relationship between logistic activities and their value, we can improve total gross profit through advancing or declining some kinds of activity. Firstly, figure out cost function $p = f_m a_{ij}$ ($j=1,2,\dots,t$) which describe cost on each logistic activity of product i and gross profit function F .

$$p \begin{cases} p_1 = f_1(\alpha_{i1}) \\ p_2 = f_2(\alpha_{i2}) \\ \dots \\ p_m = f_m(\alpha_{im}) \end{cases}$$

$$F \begin{cases} F_1 = f_1(\alpha_{i1}) - q_1 \\ F_2 = f_2(\alpha_{i2}) - q_2 \\ \dots \\ F_m = f_m(\alpha_{im}) - q_m \end{cases}$$

$$q_m = \sum_{j=1}^n \left(\sum_{i=1}^m \alpha_{im} \theta_i \right) c_j + v_m$$

Then, derive differential coefficient of $\alpha_{11}, \alpha_{12}, \dots$, from above gross profit function and work out extremum point and value-added area $\alpha_1, b_1, \alpha_2, b_2, \dots, \alpha_t, b_t$. If $\alpha_{i1}, \alpha_{i2}, \dots, \alpha_{it}$ fall in these areas, then we can add more these activities. Otherwise, fall these activities. So, more profit can be gained from agricultural logistic.

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6. References

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