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## Economic Analysis of Agricultural Product Prices Raised by the Logistics Link

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**Abstract:** Agriculture is the foundation of the people's life. Domestic agricultural product prices have grown for several times. Facing the stubborn problems of the agricultural products of "low purchase price but high retail price", detailed analysis of agricultural product logistics in China, the author concludes the reasons of the high logistic cost. I hope through this research to explore and establish modern logistics system according China's national conditions and status of the modern logistics of agricultural products circulation, in order to reduce logistics costs in China provide a reference value of agricultural products.

**Key words:** Agricultural product logistics, double charges model, third-party logistics supply chain, vertically integrated logistics system

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### INTRODUCTION

Since the pork price was raised firstly in 2006, domestic agricultural product prices have grown for several times. About the reasons there are different versions, but the major ones are as following:

- The prices rise directly due to the inflation
- The financial speculation became the driving force behind some critical price rise
- The prices rise along with the manufacturing costs
- The enlarging urban encroachment raised the costs of farming land
- Links in the logistics chains are also a reason

“The agricultural product logistics has come to a choked point restricting the development of agricultural products circulation with comparatively low general level but high costs” (Sarkis, 2003). In 2010, the total amount of the national social logistics had reached 7.1 trillion yuan, an increase of 16.7%, accounting for about 18% of GDP which was twice as much as it in developed countries. The domestic logistics costs generally accounts for twenty to thirty percent in total costs and grain logistics reaches more than 40% in logistics costs and the fresh product costs 60%; in developed countries, the logistics costs is kept to about 10% under control.

### DOMESTIC AGRICULTURAL PRODUCT LOGISTICS MODE

“Agricultural product logistics refers to the entity flow process of agricultural products between supplying

party and demanding party resulting from the sales of agricultural products” (Tage, 2000). Through investigation the major agricultural logistics mode is classified into following categories:

- Agricultural Product Producer--Retail Terminal-Agricultural Product Consumer

The above mode is the optimal selection in agricultural production of household management characteristics, reducing intermediate links in circulation process and earning additional income for farmers in slack seasons. There are also many problems following: Production chains is lopped; logistics radius is extremely limited; transaction costs increases (Williamson, 1975):

- Agricultural Product Producer-Wholesales in Origin Place-Retail Terminal ( or Wholesale Market in Sales Areas)-Agricultural Product Consumer

This mode reduces farmers' transportation costs, namely, to exchange in fields directly, but it also restrains farmer from receiving information and eventually results in the contracts they signed deviate from market price; furthermore, during the exchange with wholesalers, to avoid information asymmetry and loss, farmers have to undertake high transaction costs (Nagurney and Toyasaki, 2003):

- Agricultural Product Producer-Wholesales Market in Origin Place-wholesales Market in Sales Areas-Retail Terminal-Agricultural Product Consumer

This mode is another important form in domestic agricultural product logistics currently. This form can exert the influence of the market, reduce the transaction costs for producers to a certain extent and enlarge its logistics radius significantly, but the intermediate links come to be complicated, price formation chain extends too long, then the logistics costs increases:

- Agricultural Product Producer-Product Processing Enterprise-Wholesales Market in Sales Areas (or Retail Terminal)-Agricultural Product Consumer

This mode generally refers to enterprises purchase farmers' products according to contracts, sell products to consumers after processing and packaging, or distribute products to wholesalers and retailers for sales (Williamson, 1985). However, this mode is not available to develop widely. On one hand, few develop into leading enterprises (Seuring, 2001). On the other hand, the supervision system, the supply chain system and the risk prevention system still have defects.

#### THE CAUSE

**Loss is higher in the process of agricultural products logistics in our country:** At present, China's agricultural logistics way falls behind, however, agricultural products is not easy to store, in the process of agricultural products in circulation loss is very large. According to statistics, the loss rate of fruits, vegetables and other agricultural products in picking, transportation, storage and logistics link is in 25~30%, while developed countries lost controls under 5%.

**Circulating link of agricultural products is complex:** In china, the most of the circulation of agricultural products is the traditional model, agricultural products from the production, circulation and ultimately to consumers' hands takes a series of the intermediate links. It is agricultural products production and sales of the intermediate links, not only logistics cycle extended and logistics cost increase greatly, but also caused a lot of loss and waste.

**Technology demand of the circulation of agricultural products is high:** Agricultural products have a very strong requirements on "fresh", should try to reduce the circulation time. Especially the fresh agricultural products, it is particularly high to the requirement of logistics facilities, including preservation, cold storage and epidemic prevention, etc (Liu *et al.*, 1998). These equipment and technology is increased the logistics cost.

**Agricultural products of asset specificity is high:** In the logistics system, due to the lack of proprietary technology that has obvious characteristics of asset specificity, causes a serious shortage in the application of special assets (Van Hoek, 1999). Also logistics services can't meet the requirements of the owner's standard.

**Transaction cost in logistics is high:** In China, agricultural traders spread out, it uniform the scale effect of information collection, the cost of search for a relatively is high and agricultural commodities tend to passively accept the regulation of market information, agricultural traders bear the loss due to information error (Noci, 1997). The main body of the agricultural product market is a single transaction, negotiation is expensive.

**Road to charge in disorder:** In 2010, the Chinese goods transport volume is 32 billion tons, of which nearly 75% are borne by the highway, tolls accounted for 20 to 30% of the cost of transportation. For logistics fees, in 2010, our country logistics rate is 9.9%, compared to 4.8% of the Japanese.

#### DOUBLE CHARGES MODEL

Based on the analysis of logistic status and economic behavior of household, the purpose of this article is using double marginalization model in Industrial Economics to proof the rationality of vertical integration (Houlihan, 1985). To simplify this model, we establish a logistics chain of apple market, in this chain we consider all apple retailers as one production enterprise M and combine all purchasers as enterprise R. Hypothesis are made as listed below:

- Enterprise M is the only supplier of enterprise R, enterprise R shall directly face all consumers. Under this condition, the demand curve of enterprise R shall be exactly the same as market demand curve
- All products sold in enterprise R are coming from enterprise M
- The marginal cost ( $MC_m$ ) is a constant.
- The product inverse demand curve (DD curve) of enterprise R is  $P_R = D(y) = a - by_R$
- Assume  $C_R$  is the total cost,  $P_M$  is the retail price of enterprise M,  $C_E$  is the other cost of each product,  $y_R$  is the product quantity. The total cost of enterprise R include the total price of  $y_R$  products and other relevant cost (like transportation, storage and packaging),  $C_R = (P_M + C_E) \times y_R$

The double marginalization motel in this article has softed the conditions in the original model. In the original model, the total cost of enterprise R only include  $P_M$ , adding the other cost  $C_E$  made the model even closer to reality:

$$C_R = (P_M + C_E) \times y_R$$

$$\therefore MC_R = P_M + C_E$$

$$P_R = D(y) = a - b y_R \Rightarrow y_R = \frac{a - P_R}{b}$$

$$\pi_R = (P_R - P_M - C_E) \cdot y_R$$

$$\pi_R = -\frac{P_R^2}{b} + \frac{P_R}{b}(P_M + C_E + a) - \frac{a}{b}(P_M + C_E)$$

Take the first derivative of  $P_R$  and make it zero:

$$P_R = \frac{P_M + C_E + a}{2}; y_R = \frac{a - P_M - C_E}{2b}$$

Enterprise M does not face consumers directly, it's sales amount is the purchasing amount of enterprise R. In the original model, the demand curve of enterprise M is the marginal-revenue curve ( $MR_{(R)}$ ) of enterprise R. The double marginalization motel in this article assumed:

$$C_R = (P_M + C_E) \times y_R$$

$C_E$  is an exogenous variable, so  $MR_{(M)}$  (marginal-revenue curve of M) move down  $C_E$  will be  $MR_{(R)}$ , we can use  $MR_{(R)}$  calculate out  $P_M$ :

$$P_M = a - 2by_M - C_E \quad (y_M = y_R)$$

$$\Rightarrow y_M = \frac{a - P_M - C_E}{2b}$$

$$\pi_M = (P_M - C) \cdot y_M \quad (C = MC_M)$$

Take the first derivative of  $P_M$  and make it zero:

$$P_M = \frac{a + C - C_E}{2}; y_M = \frac{a - C - C_E}{4b}$$

By  $P_M, Y_M$  we can calculate out:

$$P_R = \frac{3a + C_E + C}{4}; y_R = y_M$$

$$\pi_M = \frac{(a - C - C_E)^2}{8b}$$

$$\pi_R = \frac{(a - C - C_E)^2}{16b}$$

After vertical integration, Enterprise M and R are combined as one enterprise, this enterprise will face consumers directly, so there shall be no other cost besides  $P_M$ , the marginal cost of new enterprise will be as same as M's marginal cost  $C_M(C)$ . The new enterprise will chase it's maximized profit, it will make marginal income equals marginal cost, that we can come up with concludes as below:

- Demand curve after combine:  $Ddt$ :

$$P = a - by$$

Profit after combine:

$$\Pi = \frac{(P - C - C_E)(a - P)}{b}$$

Take the first derivative of  $P$  and make it zero:

$$\Pi = \frac{(a - C - C_E)^2}{4b}$$

Take a easy comparison, we can see under the double price situation,  $P_R > P_t$ , it explained why agricultural products market have this weird circle: Household produce less and cheap product, consumers buy them at high price. After combination of enterprise,  $\Pi > \Pi_z$ , it proves the theory feasibility of vertical integration.

## CONCLUSION

First, improve the agricultural products and the velocity of money, reduce logistics cost. Modern logistics in the logistics distribution has large scale, high speed, wide radiating surface, high efficiency advantages. The development of modern logistics of agricultural products, can reduce the circulation, improve the velocity of circulation of agricultural products, reduce the backlog of agricultural products and the cash flow of the cost, at the same time Through large-scale production to form scale effect, So, as to effectively reduce logistics cost.

Second, the development of logistics industry and reduce logistics cost, to increase farmers income. Farmers spread in our country, not only cost is high, but because of inadequate information, often defeat. To develop

agricultural products logistics industry, to organize farmers, the organization of agricultural products logistics activity, namely self-conducting logistics, also can entrust a third party management to produce effect of labor division, the result can make the stable growth of farmers' income.

Thirdly, agricultural product logistics system is an important way of promoting the industry of agriculture products in china. In reality, most of agriculture products in china not only in quality but also in appearance are lack of competitiveness, its circulation in the process of product delivery and distribution capacity is insufficient, with high translation costs, large loss and much waste. Actually, an important support for the development of modern agriculture is made thousands of households of agricultural products through low cost, high efficient logistics system send to the hand of consumers. Effectively get rid of "Hurt, in your hurt people".

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