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The Application of Busywork Flow in Supply Chain Management of Fruits

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Abstract Firstly, I point out the problems in the fruit supply chain management. Then through field survey, we know that busywork flow plays a very important role in the fruit supply chain management. I establish the mathematical model, to derive that the supply chain management of corporate procurement and supply network is the optimal economic model. In terms of the performance of supply chain, I draw the following conclusions: (i) Busywork flow can achieve the supply chain management, and reduces logistics costs in the whole process of circulation; (ii) Busywork flow can improve logistics services for the customers and reduces coordination costs; (iii) The establishment of modern information system can reduce logistics costs; (iv) Busywork flow can improve distribution efficiency and reduce costs; (v) Busywork flow can reduce and avoid the costs of return of goods; (vi) The operation of the busywork flow can achieve integrated transport and business outsourcing to third-party logistics, thereby reducing costs, reducing transport links, reasonably choosing the means of transport, formulating the optimal transportation plan, improving the mode of transport, and increasing the cargo loading amount. (vii) Busywork flow promotes the use of e-commerce. I also express my own views on upgrade version of corporate procurement and supply network. Finally I point out some problems in the existing corporate procurement and supply network, and put forward the following recommendations: developing township-level 4S fruit shop according to the business development, with the functions of purchasing apple, supplying means of agricultural production, providing technical services and developing market; building "corporate ecological orchard" through holding.

Key words Busywork flow, Fruits, Supply chain management, Corporate procurement and supply network

1 The problems in supply chain management of fruits

The supply chain of apple products in enterprise is divided into five links: the link of agricultural materials supply; the link of fresh fruit production; the link of fresh fruit processing; the link of fresh fruit circulation; the link of fresh fruit consumption. The link of agricultural materials supply includes procurement management of agricultural materials, supporting links of agricultural materials, production and packaging of fresh fruit, involving the fresh fruit production plan and management. The link of fresh fruit circulation and the link of fresh fruit consumption are the marketing links of apple products.

The supply chain management of enterprise is faced with the following problems:

(i) The awareness of market-oriented concept based on the supply chain management is not strong. On the one hand, the producers of fresh fruit lack effective communication with consumers; on the other hand, the market-oriented role of market management system of fresh fruit is insufficient, with slow reaction to changes in the fruit market, lacking fresh fruit market-oriented behavioral consciousness. In the supply chain of apple products, the production organizations are small and dispersed, with low degree of organization, and the role of the leading enterprises in the supply chain of apple products is not obvious.

(ii) Severe fracture of the fruit supply chain, disorderly market competition and unsound market system lead to low integration degree of the fruit supply chain. There are trade barriers in the fruit distribution market area, and the network system, transaction mode and service means of fruit trade market are backward, thus it is difficult to connect the supply chain of the origin with the supply chain of sales, so as to form the integrated supply, procurement, sales and service system. In addition, there is the problem of assets specificity of fruit supply chain[1].

The national leading enterprise-Huasheng Fruit Industry Group, has practised in northern Shaanxi fruit area for a decade, and it finally worked out an innovative model of supply chain management in line with China's rural development[2]. Premier Wen Jiabao once personally visited Huasheng Fruit Industry Group, and praised that Huasheng's procurement and supply network is "little apple, big economy". This innovative supply chain model of agricultural products provides a valuable reference for the theorists and practicers.

2 The contribution of corporate procurement and supply network building of fruit industry to traditional supply chain management

In terms of management, the corporate fruit industry procurement and supply network should be in strict accordance with the principle of supply chain management ("eight kinds of unification", "management at different grades", "two-level checking", "two key points", "eight items of control")[3].

(i) "Eight kinds of unification": unified image; unified

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standards; unified procurement and supply; unified distribution; unified final payment; unified service; unified personnel; unified information.

(ii) "Management at different grades": the fruit industry companies manage the sales network, production and processing center at the provincial level, the procurement and supply network companies manage the sales network, production and processing center at the county, township and village level.

(iii) "Two-level checking": one level is the fruit industry companies, and the other level is rural services companies.

(iv) "Two key points": cost and capital.

(v) "Eight items of control": network copy; parity procurement; costs veto; budget control; costs responsibility system; profit and loss assessment; risk mortgages; the survival of the fittest.

The managers have long realized the importance of supply chain integration: only by strengthening the connection between the upstream link of the supply chain (suppliers) and the downstream link (customers), quickening the capital turnover, and ensuring that each phase of work (busywork flow) is completed with the appropriate cost and quality at the right time, can the companies reduce costs and increase profits, achieving maximization of the benefits.

Through the field research and survey of apple production base in northern Shaanxi, I sum up the contribution of corporate procurement and supply network to supply chain management theory as follows: it is China's first specialized agricultural organization constituted by the service teams in the origin. Through ten years of exploration, the enterprise first proposed and established the corporate procurement and supply network constituted by the service teams in the origin as the main body, opening a prelude to the revolutionary wave of fruit supply chain management. The business flow, goods flow, capital flow, and information flow in the fruit supply chain "do things in their own way disregard of the overall situation". After the corporate procurement and supply network is advanced and practised, the busywork flow management integrates all links of the supply chain.

The so-called busywork flow means that the service teams carry out the operation of all supply chain links, and integrate all supply chain links. This principle once again proves that either success or failure boils down to the same supply chain management (the human factor is the first). According to the service teams' expected sales volume, the agricultural materials in the corporate procurement and supply network are distributed from the producers of agricultural materials to village-level service stations, through the trunk transport, and the service teams establish the transfer warehouse of agricultural materials. Some concepts are used, such as group budget for procurement, trunk transport, alternative branch line transport, virtual distribution, and virtual inventory. It makes some costs in the supply chain management costs decrease greatly, such as procurement costs, transportation costs, distribution costs, inventory costs, and operating costs.

All logistics business is outsourced. The corporate procurement and supply network outsources all the logistics business in the fruit supply chain to third-party logistics companies. There are three major driving forces as follows:

(i) In terms of operation, it can simplify the organization, and save the energy and time spent on the research of logistics knowledge and logistics business management, to improve management efficiency.

(ii) Facts prove that it is very difficult for the enterprise to reduce logistics costs on its own. It is a priority to make all departments minimize the costs, address and reduce the problems of all kinds of operating costs. Pragmatic, low-key, and simplistic styles in the corporate culture are applied to the supply chain management.

(iii) In terms of strategy, focusing resources on the core competitiveness of enterprises, can make us get the maximum return on investment.

The fruit procurement and supply strategy of the corporate procurement and supply network: the fruit is positioned as "Huasheng" apple, having independent intellectual property rights, and independent research and development formula fertilizer. Taking the independently researched and developed varieties as the key brands; strengthening the width of the fruit combination; in terms of fruit packaging, taking separate packaging and series packaging; in terms of fruit brand, adopting multi-brand strategy and brand extension strategy.

Pricing strategy: setting a price according to the business goals, production costs, competitors' prices, and consumers' expected prices.

Channel strategy: forward, integrating the production enterprises of agricultural materials; backward, integrating the county-level, township-level, and village-level network system; setting up the department of agricultural materials, to help to establish the supply chain system integrating busywork flow, business flow, goods flow, capital flow, and information flow.

Promotion strategy: adhering to the principle of sustainable development to create "Huasheng" brand, and highlight the social responsibility of the department of agricultural materials.

The procurement and supply network and the departments related to the network are linked as a unified whole in terms of economy, process and function, as is shown in Fig. 1 and Fig. 2[4].

Moreover, the theoretical contribution of corporate procurement and supply network to the supply chain management of fruits includes the following aspects:

(i) The principle of effectiveness. According to the actual situation of the origin, the corporate procurement and supply network adopts the principle of effectiveness and minimization of cost control, and establishes the township-level service stations according to the size of the volume of business.

(ii) The principle of efficiency maximization. Given that the network nodes are the village-level service staff, how to play the staff's role, to reduce the logistics links and strengthen simplification processing becomes the priority.

(iii) The principle of adding value. Other projects are loaded on the network to increase the service function value. Initial-

ly, the network construction is only for procurement of apple; now, it has gradually realized and loaded the agricultural materials supporting, technical services, market development and other functions.

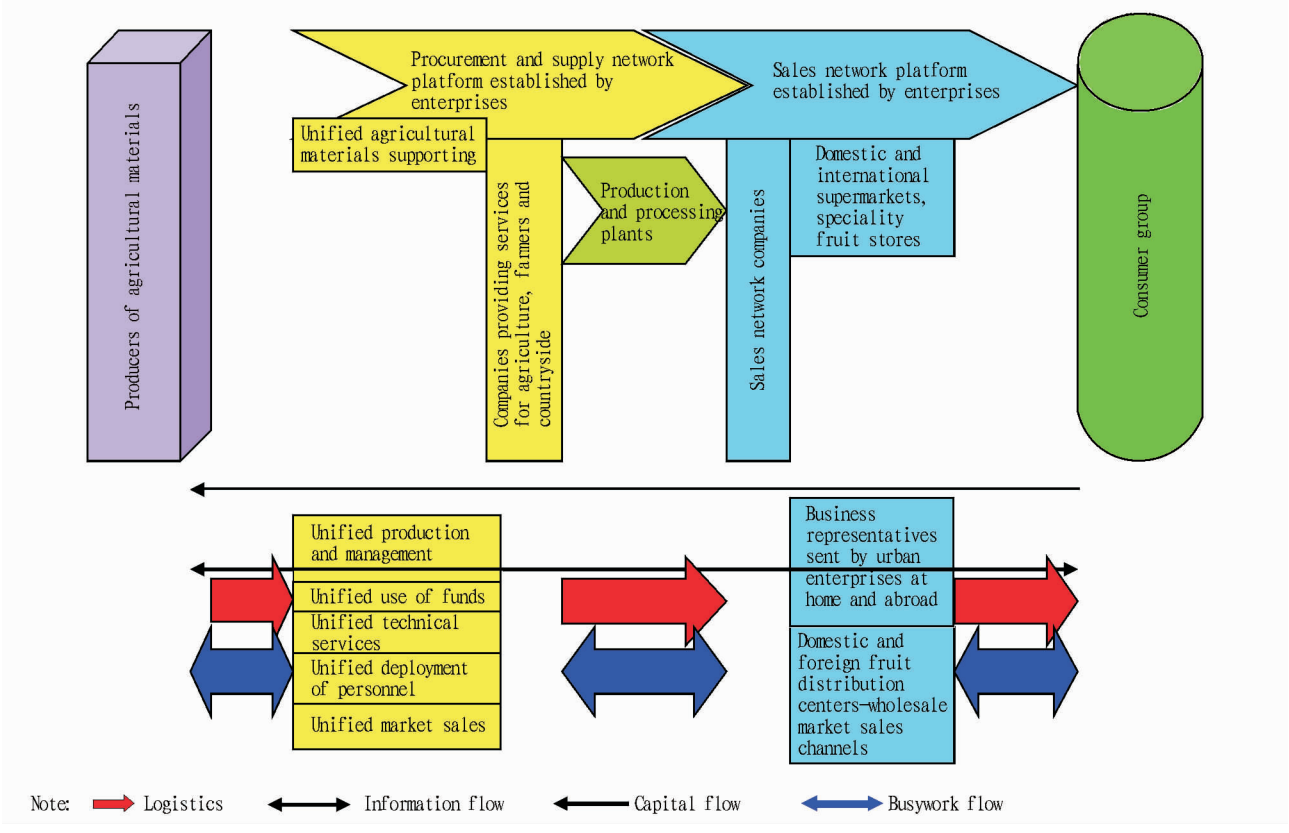

Fig. 1

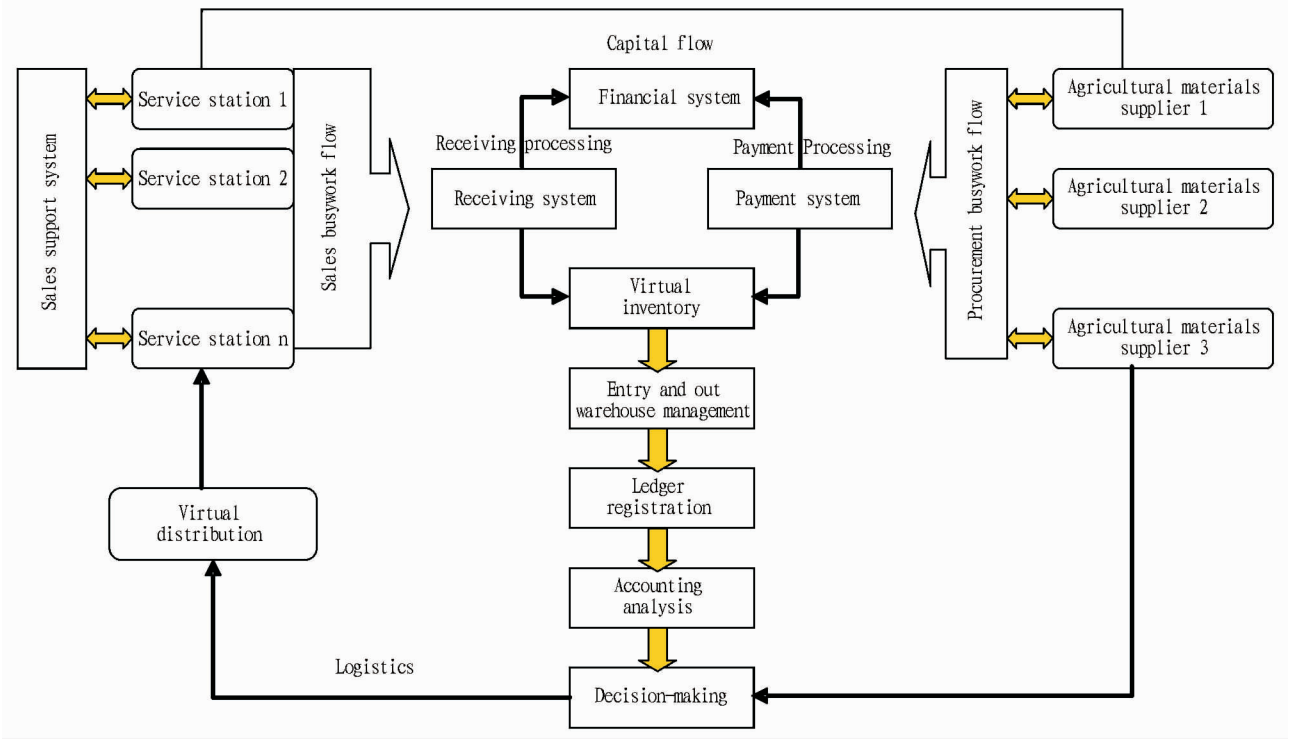

Fig. 2 Busywork flow in the supply chain management of corporate procurement and supply network

(iv) The principle of synergism. The administrative instructions are unified to achieve coordinated operation of the network nodes.

(v) The principle of competition. The staff's performance is appraised, to achieve the effect of market competition and staff competition.

(vi) The principle of concentrated development and rolling development. The enterprises must not be developed blindly, and they should be developed one by one according to the actual situation of origin. By the establishment of county-level service stations, it is necessary to strengthen the orchard production and management, foster sales experts in various towns and villages, creating opportunities to the farmers. Through the assessment of business indicators in village-level service stations, the competent persons remain, and those persons with misconduct, who do not finish the task and accept the corporate culture, are eliminated, thus ensuring healthy and stable development of corporate procurement and supply network[5].

3 Modeling of performance indicator evaluation system of the supply chain management of corporate procurement and supply network

The layout of corporate procurement and supply network is determined according to empirical data. In theory, one service point is established in each administrative village, with characteristics that there is no store, distribution center and warehouse, and the service staff complete the relevant supply chain functions through busywork flow. The traditional supply chain theory requires the township-level service stations to set up at least one distribution center.

Through the establishment of mathematical model, this article compares two models (establishing the distribution center and never establishing the distribution center), to derive the indicator system for evaluating the performance of supply chain[6].

This model assumes the two-way logistics mode which can not only purchase apple but also supply agricultural materials. If the least transport volume of village-level service stations is b_k, the objective function of total planning cost is as follows:

$$\min C = \sum k_j F_j + \sum\sum v_j x_{ijk} + \sum\sum (d_{ij} + h_{jk}) x_{ijk} + \sum\sum q_{jk} y_{ik} \quad (1)$$

where k_j is the node j's state (when $k_j = 1$, the distribution center is established; when $k_j = 0$, the distribution center is not established); d_{ij} signifies the transportation cost per unit transport volume from marsh warehouse i to distribution center j; h_{jk} signifies the transportation cost per unit transport volume from distribution center j to village-level service station k; q_{jk} signifies the transportation cost per unit transport volume from marsh warehouse i to village-level service station k; y_{ik} signifies the unit transport volume marsh warehouse i to village-level service station k; x_{ijk} signifies the unit transport volume from marsh warehouse i to village-level service station k via distribution center j; d_{ijk} signifies the transportation cost per unit transport volume from marsh warehouse i to village-level service station k via distribution center j; $d_{ijk} = d_{ij} + h_{jk}$; w_j signifies the unit transport volume via distribution center j, $w_j = \sum x_{ijk} + h_{jk}$; v_j signifies the variable cost per unit transport volume in distribution center j; F_j signifies the fixed cost of distribution center j.

The constraint conditions are as follows:

$$\begin{cases} \sum x_{ij} + \sum y_{ik} \geqslant b_k,\ k = 0, 1, 2, \cdots, z \\ x_{ij} \geqslant 0,\ b_k = 0,\ i = 0, 1, 2 \cdots\cdots, m;\ j = 0, 1, 2, \cdots, n \quad (2) \\ y_{ik} \geqslant 0,\ i = 0, 1, 2, \cdots, m;\ j = 0, 1, 2, \cdots, z \end{cases}$$

Taking the case of forward-direction logistics of procurement of raw material of fruits, the first term of the total cost function C is the fixed cost of the distribution center; the second term is the variable operating cost of the distribution center; the third and fourth terms are transport cost and distribution fee.

Obviously, if the amount of goods passing the distribution center is equal to 0, it indicates that this distribution center does not need to be built (or adopted).

Assuming that a township service station sets up two distribution centers, their fixed costs are 10 000 yuan and their variable fees are 10 yuan/ton; five village-level service stations need to directly transport the fruits to the marsh warehouse; there is one marsh warehouse. Freight and amount can be seen in Table 1[7].

Substituting these values into the objective function, using the lingo software, I conduct calculation: $C = 62\ 400$; $k_1 = 1$, $k_2 = 1$; $x_{11} = 70$, $x_{21} = 60$, $x_{31} = 0$, $x_{41} = 0$, $x_{51} = 0$, $x_{12} = 0$, $x_{22} = 0$, $x_{32} = 0$, $x_{42} = 90$, $x_{52} = 80$; $y_{11} = 0$, $y_{21} = 0$, $y_{31} = 0$, $y_{41} = 0$, $y_{51} = 0$.

The significance of these solutions is as follows: the distribution center is built in both place 1 and 2; the least transport volume from the village-level station k_1 and k_2 to the distribution center 1 is 70 tons and 60 tons, respectively; the least transport volume from the village-level station k_4 and k_5 to the distribution center 2 is 90 tons and 80 tons, respectively; the least transport volume directly from k_3 to the marsh warehouse is 50 tons; the transport volume of other service stations is 0; the total cost can be the least (62 400).

Table 1 Freight and amount

From village-level service stations to the marsh warehouse via distribution centers	d_{11}	d_{21}	d_{31}	d_{41}	d_{51}	d_{12}	d_{22}	d_{32}	d_{42}	d_{52}
Freight(yuan/ton)	100	130	300	340	330	340	330	320	120	110
Directly from village-level service stations to the marsh warehouse	q_{11}	q_{21}	q_{31}	q_{41}	q_{51}					
Value(yuan/ton)	360	370	100	350	345					
The least restriction on village-level service stations	b_1	b_2	b_3	b_4	b_5					
Amount restricted(ton)	70	60	50	90	80					

Taking the case of reverse logistics of agricultural materials procurement, assuming that recently the corporate procurement and supply network purchases 8 000 tons of fertilizer with special formulation, and the procurement capital is 21.76 million yuan (the freight is 115 yuan/ton; handling fee is 15 yuan/ton; business royalty is 1.44 million yuan; wage is 0.692 million yuan; travel expenses are 0.15 million yuan; advertising costs are 0.15 million yuan; delivery costs and inventory costs are 0; transportation costs are the optimal; fertilizer products do not need to pay taxes).

Total gross profit = total sales – cost of procurement – transport costs – handling charges – delivery costs – inventory charges – management fees – others = 2.960 – 2176 – 144 – 92 – 12 – 69.2 – 15 – 8 = 4.438 million yuan, gross margin = 443.8 ÷ 2516.2 × 100% = 17.64%[8].

From the above analysis of minimized operating cost of two – way logistics, we draw the conclusion that there is no need to set up township-level distribution center.

4 Conclusions and recommendations

Since the core of corporate procurement and supply network is the service team in the origin, busywork flow has virtually assumed considerable supply chain operation work. In terms of the performance of supply chain, I draw the following conclusions: (i) Busywork flow can achieve the supply chain management, and reduces logistics costs in the whole process of circulation; (ii) Busywork flow can improve logistics services for the customers and reduces coordination costs; (iii) The establishment of modern information system can reduce logistics costs; (iv) Busywork flow can improve distribution efficiency and reduce costs; (v) Busywork flow can reduce and avoid the costs of return of goods; (vi) The operation of the busywork flow can achieve integrated transport and business outsourcing to third-party logistics, thereby reducing costs, reducing transport links, reasonably choosing the means of transport, formulating the optimal transportation plan, improving the mode of transport, and increasing the cargo loading amount. (vii) Busywork flow promotes the use of e-commerce[9].

Of course, there are some bottleneck problems in the corporate procurement and supply network, such as poor security of use of funds, low overall network efficiency, defects in the logistics functions arising from the shortage of store, delivery warehouse, difficulties in circulation and formation of brand.

Finally I put forward the following recommendations: developing township-level 4S fruit shop according to the business development, with the functions of purchasing apple, supplying means of agricultural production, providing technical services and developing market; building "corporate ecological orchard" through holding[10].

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