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Application of E-commerce Agricultural Aid Model in the Digital Economy Era

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Abstract In the era of digital economy, with the continuous development of e-commerce platforms, the mode of e-commerce helping agriculture has become the main mode of China's agricultural economic development, and has achieved good results. However, there are also many problems in practical application, which not only have a great impact on rural areas, but also cause certain economic losses. Based on this, from the perspective of the digital economy era, this paper analyzed the current situation of the application of e-commerce agricultural aid model, and put forward some countermeasures and suggestions. Based on the investigation of the actual situation of the agricultural activities carried out by the JD e-commerce platform, this paper also analyzed and compared the choices of the main products of farmers-fresh commodities on the e-commerce platform. The experimental findings showed that the proportion of fresh category orders of POP (pctowap open platform) merchants was stable at more than 80%, and the maximum was 97%, while the proportion of orders of self-operated+FBP (Fulfillment by POP) order mode was only 3%. This also shows that the POP business operation mode has great advantages. Based on the current network experience of rural farmers, especially those in poor areas, this paper gave reasonable suggestions and believed that their own capital risks and losses could be avoided through network marketing.

Index Terms E-commerce Agricultural Aid Model, Digital Economy Era, Analytic Hierarchy Process, Electronic Commerce

I. Introduction

The issue of agriculture, rural areas and farmers is the top priority of the whole Party and is associated with the people's livelihood of the country. In recent years, the pace of China's agricultural and rural modernization has accelerated. As an effective driving force and carrier, rural e-commerce has opened up a new development path for farmers.

Under the new historical conditions, rural e-commerce is not only the engine of agricultural development, but also an essential force to promote the development of rural industry, and also an effective carrier to achieve targeted poverty alleviation. With the rapid growth of rural e-commerce, the deep growth of rural industries, the reduction of urban-rural differences, and the fundamental changes in traditional sales methods have changed the original agricultural production structure. Through the growth of e-commerce, many agricultural products are sold online, which has played a positive role in promoting farmers' employment, entrepreneurship and income increase, leading agricultural production to the mainstream.

Developing country governments should recognize not only the positive impact of e-commerce on agro-industry growth, but also the premise and logic of how e-commerce can play a predominant role. Li Lei aimed to study the impact of e-commerce capability on the performance and income of agricultural enterprises through organizational agility [1]. In e-commerce, businesses can be carried out with the help of computers. Gopinath R used electronic data exchange to apply information and communications technology (ICT) to achieve sustainable agricultural development [2]. Agricultural e-commerce cluster is a new phenomenon in rural China. Taking Shuyang County, Jiangsu Province as an example, Zeng Yiwu proposed a comprehensive model to reveal the formation mechanism of agricultural e-commerce clusters [3]. It has become necessary to develop digital lifestyle and industries based on digital technology. Because of the changes in the characteristics of consumers' shopping, that is, fast, practical and cheap, this has become a "serious threat" to traditional enterprises.

E-commerce is a means to promote rapid, inclusive and sustainable economic growth, improve living standards and reduce poverty. In the era of digital lifestyles, Karine H. A. J. I explored potential areas of cooperation among BRICS countries in developing e-commerce in rural and remote areas for poverty eradication [4]. Millennials are very familiar with digital technology and have become potential targets for increasing market share. Tayibnapis Ahmad Zafrullah used primary data and secondary data, focusing on the e-commerce agricultural aid model of

small and medium-sized enterprises and the consumption ability of consumers as Internet users. The results showed that there were still some problems in the e-commerce agricultural aid model that need to be solved to avoid hindering the growth of Indonesia's digital economy and the stability of the financial system [5]. However, they did not analyze various e-commerce agricultural aid models, nor listed their advantages and disadvantages.

To solve the economic level of rural areas in China and reduce the gap between the rich and the poor, this paper proposed an analysis of the model of e-commerce helping agriculture in the era of digital economy. First, the current situation and problems of e-commerce in helping agriculture were analyzed, and the analytic hierarchy process was proposed. Then, the corresponding rectification suggestions for the problems were put forward, and an example analysis was carried out in the experimental part. The fresh products of JD operators were analyzed. The experimental findings indicated that the scale of e-commerce to help farmers was growing slowly, especially in the fresh food market, and the effect is very significant. The innovation of this article is that this article not only has analyzed the current situation, but also has conducted an example analysis for a big operator like JD, which has increased the authenticity of the article.

II. E-commerce Agricultural Aid Model in the Era of Digital Economy

II. A. Current Situation and Problems of E-commerce Agricultural Aid Model

E-commerce agricultural aid model was put forward under the background of the digital economy era. This model has broken through the restrictions of traditional sales channels on agricultural products sales to a certain extent, and also made the distance between agricultural products and consumers continuously shorten. It has better achieved the balance of interests between consumers and producers, and has improved the economic level of rural areas in China to a certain extent [6], [7]. The e-commerce agricultural aid model can also better promote the characteristic agricultural products in rural areas, so as to realize the adjustment and optimization of the industrial structure in rural areas. The model has gained popularity in rural areas of China since its implementation because of its ability to effectively solve the problems of traditional sales channels. By the end of 2019, China had more than 100000 e-commerce platforms engaged in agricultural products sales.

As e-commerce has developed rapidly in recent years, a good environment for e-commerce development has been formed in rural areas of China. By effectively using and making full use of the advantages of the e-commerce platform, it has driven the rapid growth of the economy in rural areas. According to the relevant survey results, China's rural areas have realized the transformation and upgrading of the "Internet plus" model, and gradually formed a variety of models such as "e-commerce+farmers+bases", "e-commerce+cooperatives+farmers" and "e-commerce+enterprises". At the same time, rural e-commerce is also moving towards agricultural industrialization. However, the application of this model has been hindered by a number of problems in the actual operation caused by various factors.

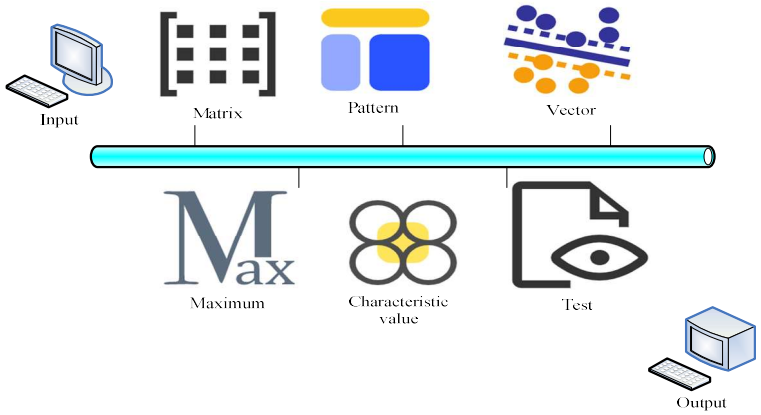

Figure 1: AHP input and output elements

II. B. Analytic Hierarchy Process

The construction of discriminant matrix is an essential part of e-commerce talent training system, and its establishment directly affects the final calculation findings of analytic hierarchy process (AHP). Therefore, at this time, it is first necessary to design a professional survey method, with professional teachers, discipline leaders, and enterprise leaders as the main survey objects. At this stage, a brief analysis of the implementation and execution issues is performed to enable better cooperation of those involved in the investigation. After completing

the statistical operation, this paper divides the analytical matrix at each level and carries out the following operations. The input and output elements of AHP are given (as shown in Figure 1). The data of AHP is based on people's understanding of the outside world.

The steps for AHP to determine the weight are as follows:

Construction of the discriminant matrix: The target is represented by X. v_j and $v_i(j,i=1,2,\ldots m)$ are composed of factors. v_{ji} describes the important indicators related to v_j and v_i. The X-V analysis matrix q is composed of v_{ji}, which is explained by Formula (1):

$$q=\begin{bmatrix} v_{11} & v_{12} & \cdots & v_{1m} \\ v_{21} & v_{22} & \cdots & v_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ v_{m1} & v_{m2} & \cdots & v_{mm} \end{bmatrix} \tag{1}$$

The key sequence corresponding to the operation: According to the judgment matrix, the vector β corresponding to the maximum value of the characteristic root is calculated, as shown in Formula (2):

$$Q_s=\beta_{max}\cdot s \tag{2}$$

In this paper, the feature vector β is normalized. Generally speaking, it is to evaluate the importance of each factor, that is, the weighted distribution of the feature vector. The correlation vector β is standardized so that the importance of each factor can be ranked accordingly, thus achieving the purpose of weighting.

Consistency analysis: At this time, Formula (3) is applied:

$$EK=\frac{EJ}{KJ} \tag{3}$$

Here, EK is the random consistency ratio of the judgment matrix. EJ represents the corresponding general consistency index, which is calculated by Formula (4):

$$EJ=\frac{\beta_{max}-m}{m-1} \tag{4}$$

KJ is the average random consistency index of the judgment matrix. If the EK of q is less than 0.1, or β_{max}=m and EJ, then q meets the ideal compatibility, otherwise the elements in q must be modified to make it meet the conditions.

In the specific total sorting, the calculation is carried out in combination with Formula (5):

$$EK=\frac{sj_1EJ_1+sj_2EJ_2+\Delta+sj_mEJ_m}{sj_1KJ_1+sj_2KJ_2+\Delta+sj_mKJ_m} \tag{5}$$

If the subsequent consistency is less than 0.1, then the consistency analysis is considered to be satisfied. On the contrary, the design of the model is reconsidered.

II. C. Optimized Path for the Development of Rural E-commerce Agricultural Aid Model in the Digital Economy Era

(1) Strengthening e-commerce business entities

The internal power of the Internet is used to actively introduce well-known e-commerce enterprises and inject new vitality into the rural economy through the Internet trading platform [8], [9]. The "scale" policy guidance should be strengthened to optimize service oriented to vigorously develop rural e-commerce. A professional e-commerce platform has been established to accelerate the e-commerce of traditional enterprises and improve the development and opening of products. Strong third-party e-commerce companies are introduced to strengthen their links with logistics companies. The building of a new model of "e-commerce+characteristic rural culture" and a new rural revitalization ecology are conducive to the development of convenient and reliable consumption channels, so as to win the market with quality and promote the sustainable development of e-commerce (as shown in Figure 2).

(2) Strengthening e-commerce brand building

Brand is an important factor affecting product quality. To ensure the quality of agricultural products, it is necessary to rely on the development of Internet technology and products. The information dissemination advantage of the Internet is used to strengthen the policy environment of agricultural industrialization and create a green and high-quality agricultural product brand. By actively introducing well-known enterprises, production and sales supervision has been strengthened, and the R&D (research and development) strength of enterprises has been improved. It is necessary to take the digital economy as an opportunity to integrate characteristic culture with rural e-commerce, unify packaging, standards and quality, create and promote characteristic organic and green certification brands, so as to facilitate consumer identification, and expand the sales of agricultural products and

expand the market. Through the establishment of specialized agricultural products logistics companies, virtual technology and high-tech means are used to vigorously develop agricultural products and high-quality characteristic brands. The safety inspection system of agricultural products has been established. The tracking of agricultural products has been strengthened, and the rural e-commerce ecosystem has been improved. The trust of consumers has been enhanced, so as to promote the rapid entry of high-quality agricultural products into the big market.

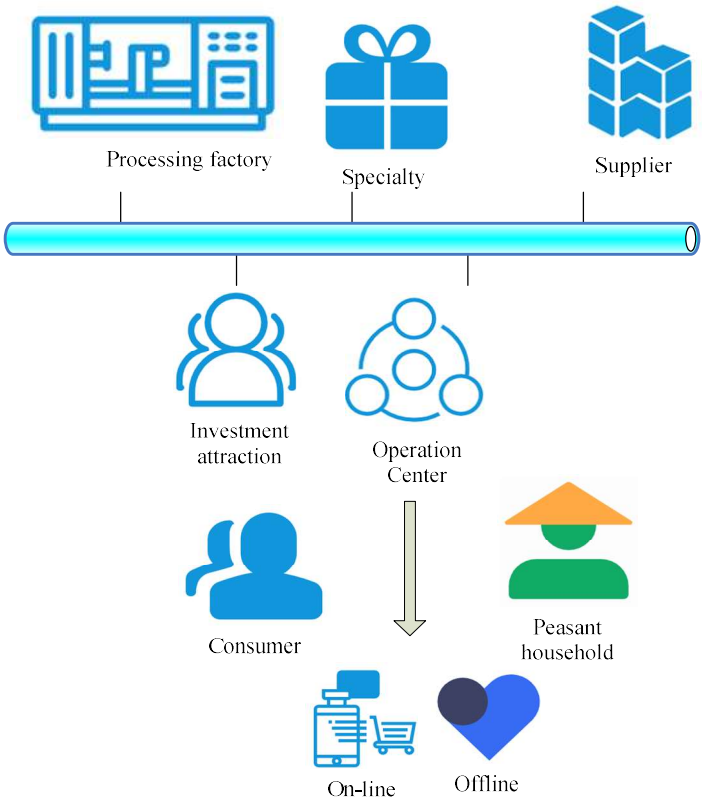

Figure 2: Operation mode of e-commerce agricultural aid model

(3) Adhering to government-led

As a new model, the growth of rural e-commerce agricultural aid model has its own complexity. It needs to adhere to the government's leadership and play a good role of the government [10], [11]. Among them, the most important thing is to make use of the advantages of the government at the policy, institutional and infrastructure levels. In addition, it is also necessary to further enhance the rural e-commerce development system, including the technical support system, talent training system, etc. In addition, the growth mechanism of rural e-commerce needs to be further enhanced, including resource integration mechanism, competition and cooperation mechanism and policy incentive mechanism. Only by adhering to the government-led and improving the corresponding mechanism can the sustainable and stable development of rural e-commerce to help agriculture be promoted [12], [13].

(4) Guiding relevant enterprises and industry associations to participate in the growth of rural e-commerce to help agriculture

At present, during the process of developing rural e-commerce to help agriculture, neither government departments nor enterprises and industry associations have fully realized the importance of rural e-commerce to help agriculture. On the one hand, as a new thing, rural e-commerce lacks experience and foundation. On the other hand, the government and companies do not focus enough on promoting the development of rural e-commerce to help agriculture [14], [15]. In this context, government departments need to deeply understand the current situation, existing problems and challenges of rural e-commerce to help agriculture, as well as government guidance strategies. It is also necessary for industry associations to make use of their functions and establish relevant standards. In addition, relevant enterprises and industry associations should also be guided to participate

in the growth of rural e-commerce to help agriculture, and these enterprises should be encouraged to play a leading role in the industry to help improve the income level of farmers.

(5) Vigorously introducing and cultivating professional talents

First, by improving rural infrastructure construction, preferential policies have been formulated to attract more talents who are interested in developing rural e-commerce to stay and take root in the countryside. Secondly, it is necessary to improve the rural e-commerce talent training system. By establishing a training mechanism combining online and offline, grass-roots e-commerce professionals and practitioners in other industries have been strengthened to provide training and guidance. “Internet plus” and other modern information technology resources have been fully utilized. In combination with the characteristics of local agricultural products, a marketing platform and channel combining online and offline has been established.

(6) Further improving rural e-commerce infrastructure construction

China’s rural infrastructure construction is relatively weak. There are also some problems in the growth of rural e-commerce, such as the lack of computers for farmers to use on the network, the poor network infrastructure and the inability to connect to the Internet for learning, and the inability to conduct e-commerce transactions without WIFI in some regions. Therefore, to further improve the infrastructure construction of rural e-commerce development, the Internet, logistics, warehousing and other aspects need to be built to provide a good environment for rural e-commerce development.

In the era of informatization, the growth of rural e-commerce is not only the necessity of the development of the times, but also an essential way to achieve rural revitalization. Local governments should fully use their development advantages to maximize the overall coordination function. Governments at all levels should strengthen cooperation to break down information barriers and improve relevant incentive systems. The development model of “e-commerce+industry+poverty alleviation” has been established to promote the rapid growth of rural e-commerce talents with market orientation. High-quality agricultural product brands have been vigorously developed. The network is truly rooted in the countryside in “blood production” and “blood transfusion” to realize the benign interaction between “e-commerce+farmers” and “helping farmers”. Driven by new technologies, the accuracy of agricultural science and technology services should be improved through innovative regulation to protect consumers’ right to know and promote the healthy and orderly development of the Internet economy, thus ensuring that all kinds of e-commerce support policies take root and helping the rural revitalization strategy succeed.

III. Benefits of E-commerce Agricultural Aid Model

III. A. JD E-commerce Agricultural Aid Model

Since JD launched the fresh food channel, JD Mall has made great efforts in this area. Several departments are doing this work. They have also transferred their experience to the sales of fresh food e-commerce. Over the years, there have been certain achievements and data. The expansion effect of e-commerce in the fresh food market, as well as the concerns of small and micro enterprises and farmers’ businesses, can be seen to have a more intuitive evaluation of the e-commerce platform’s mode of developing farmers’ businesses. This article analyzes the trend of the number of businesses opened, registered capital, registered address, sales category and sales in recent years since JD launched the fresh food channel in June 2014, and makes detailed statistics and quantitative analysis of each business in July 2016. In addition, merchants in all regions are interviewed to know whether their awareness of the platform, operating experience and actual income after joining the platform increase. This paper uses AHP to calculate the data of JD fresh food market.

III. B. Example Results

(1) Overall trend of e-commerce agriculture-related channels

JD.com has entered fresh and other agriculture-related channels in June 2014, and has achieved certain results and presented some characteristics. From the sales data, the following conclusions can be drawn. After a period of rapid development, the number of fresh e-commerce has reached more than 700. Especially after JD’s “T+1” model went online, the number of merchants settled in has increased rapidly. The “T+1” settlement mode has been adopted to effectively solve the problem of merchant capital occupation. A good store has a monthly turnover of about 8 million. If the 30-day accounting period is adopted for settlement, the merchant has a cash flow of 8 million after one month. According to the annual interest rate of 6%, businesses loses nearly 50000 yuan of interest every month. This inevitably affects the operating enthusiasm of agricultural means enterprises. This also shows that many fresh food enterprises like the way of capital recovery. What they want is a small scale of capital and fast speed. Each amount of capital should be small and the speed of capital return should be fast. E-commerce platform is used to expand sales. Although there is not much profit, the capital must be safe enough to ensure the

stability of the capital. Therefore, businesses with network experience can choose the “T+1” payment method on the JD platform or directly choose Taobao.

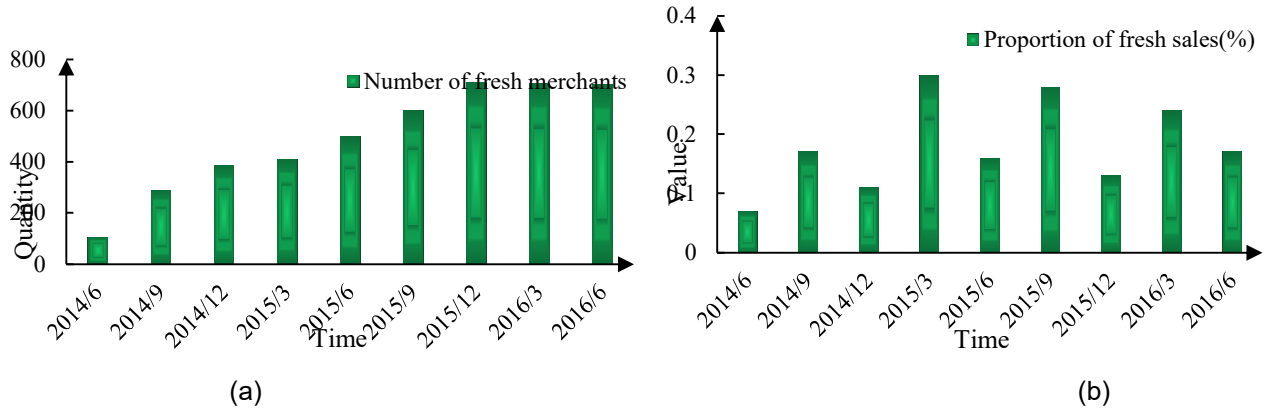

Figure 3: Statistics of the proportion of sales of fresh products and the number of fresh channel merchants in JD Mall

As Figure 3, Figure 3 (a) presents the statistics of the number of fresh products merchants in JD Mall, and Figure 3 (b) presents the statistics of the proportion of sales of fresh products in JD Mall. It can be seen from Figure 3 (a) that when JD launched its fresh products in June 2014, the number of merchants was only 105. With the development and progress of the industry, it grew almost every quarter. Until December 2015, it reached a stable state, and the number of merchants remained stable at about 700. It can be seen from Figure 3 (b) that among all JD’s products, the sales volume of fresh products fluctuated by 0.2%. This is because the characteristics of fresh products generally do not change much, and there is a big gap between the sales volume of popular appliances and category 3 digital products. Of course, this is also the reason why the fresh product layout is late and has not yet formed a scale.

(2) Benefit of agricultural marketing model

a) JD’s self-operated purchase and sales model

This is a very suitable operation mode for traditional offline stores. Merchants can deliver goods in seven warehouses of JD.com only by providing goods. The price of goods and the content of participation are determined by JD. In this mode, if a business wants to succeed, it must rely on the sales manager of JD.

b) POP mode

POP (pctowap open platform) operation mode is an open business mode for external users. JD Mall is the first to launch this model. Therefore, JD.com’s POP model is named “the open platform for merchants in JD.com”. In addition to JD Mall, it can also provide many businesses with more ways of cooperation, so that other businesses can open their own stores in JD Mall.

JD has four POP modes, and its order share is shown in Figure 4.

FBP (Fulfillment By POP): JD provides an independent backstage for merchants. From warehouse to logistics to customer service, JD is responsible for everything. All goods provided by JD can be enjoyed.

LBP (Logistics by POP): JD provides an independent background for merchants. It does not need storage. Instead, it packages all orders to five places in JD within 12 hours, and delivers them to JD Mall after 36 hours. JD can issue invoices for customers (additional tickets are required).

SOPL (Sales On POP Logistics): JD provides an independent backstage for merchants. Merchants do not need to enter the warehouse. They only need to package all orders and send them to JD’s five warehouses within 12 hours. After 36 hours, they send them to JD’s warehouse, and then the seller issues a departure ticket (not an additional ticket).

SOP (Sales On POP): JD provides an independent background for merchants, similar to Taobao Mall, which needs to deliver goods and provide corresponding services within 12 hours.

FBP is fully managed, similar to JD’s procurement method. LBP does not need the inventory of JD, but delivers to JD’s warehouse every day. SOP is to deliver goods directly to consumers and issue invoices. The profit of JD Mall is lower than the first three categories.

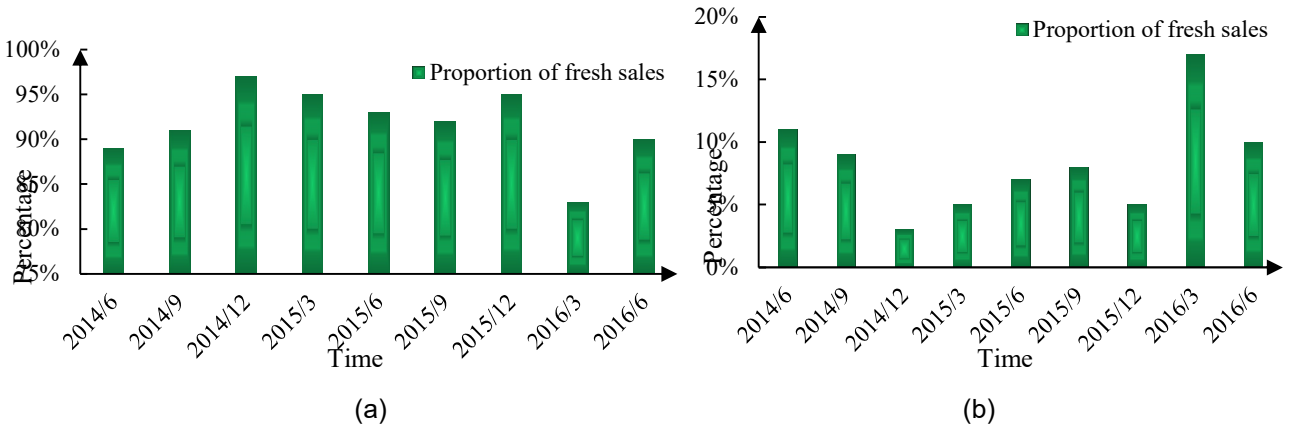

Figure 4: POP merchant order proportion and JD Mall's self-operated+FBP order mode in fresh food sales

As shown in Figure 4, Figure 4 (a) is the statistical chart of the proportion of POP merchants' orders, and Figure 4 (b) is the statistical chart of the proportion of orders in JD's proprietary mode. It can be seen from the figure that the proportion of fresh category orders of POP merchants was stable at more than 80%, and the rest were the sales of JD self-operated and FBP order models. The proportion of orders from POP merchants was up to 97%, while the proportion of orders from self-operated+FBP orders was only 3%, which also shows that POP merchant orders have great advantages.

(3) Distribution of agricultural product sales

Fresh products mainly include fruits, vegetables, meat, aquatic products, dry products and daily cooked food and pastries. The distribution of sales volume is shown in Figure 5.

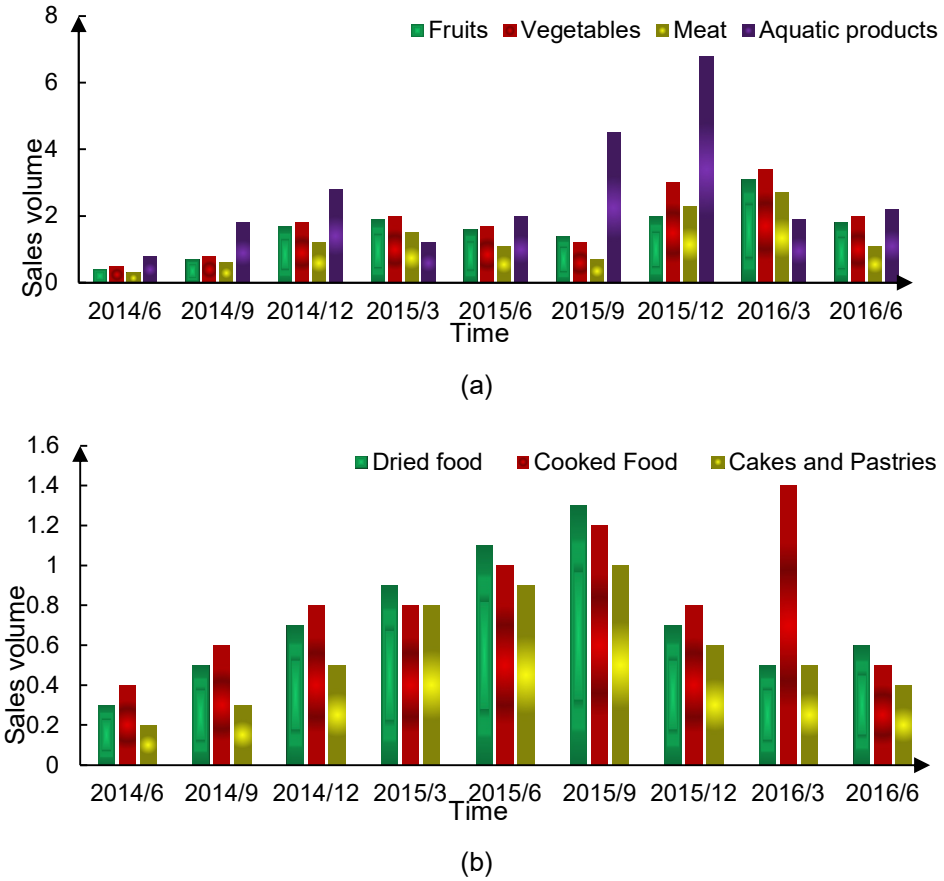

Figure 5: Statistics of fresh food sales categories in JD Mall

In Figure 5, Figure 5 (a) describes the sales statistics of fruits, vegetables, meat and aquatic products in JD Mall, and Figure 5 (b) describes the sales statistics of dry goods and daily cooked food and pastries in JD Mall. It can be learned from the figure that the largest sales volume of fresh food was seafood and aquatic products, with a maximum of 680 million. With the layout of the fruit market of JD, including fresh fruits and vegetables, the overall sales volume of fruit has also gradually increased, which also indicates that the development of e-commerce to help farmers is getting better and better.

Among them, fruits, vegetables, meat, aquatic products, dry products and daily cooked food and pastries are the seven categories with the highest sales volume. The monthly sales volume is more than 1 million yuan, and the lowest sales volume is pastry. The details of its sales are described in Table 1.

Table 1: Sales data of fresh products in JD Mall in June 2016

Ranking	1	2	3	4	5	6	7
Category	Aquatic Products	Fruits	Meat	Vegetables	Cooked Food	Dried Food	Cakes and Pastries
Monthly Sales Volume (10000)	734.56	658.32	233.67	224.31	147.33	65.78	15.43
Sales Proportion	35.33%	31.66%	11.24%	10.79%	7.09%	3.16%	0.74%

(4) Regionalization of e-commerce to help agriculture

According to the sales data of the fresh food market in Beijing, the sales of fruits, seafood, snack foods, pigs, beef and mutton, poultry, eggs, vegetables and cooked foods were all more than 100000 yuan, of which the sales of fruits, seafood and snack foods were all more than 1.5 million yuan. The sales of seafood and seafood in Beijing also reached 2.16 million. Actually, there is no seafood in Beijing. According to analysis, most of Beijing's seafood, fruit and leisure food are imported from overseas. It shows that there is a large number of inconsistency between the origin and sales places of fresh food in JDMall, especially in Beijing. According to the statistical data of the relatively underdeveloped northwest region, agricultural producers, especially local specialties, are marketed to improve farmers' income and alleviate the sales difficulties of agricultural products.

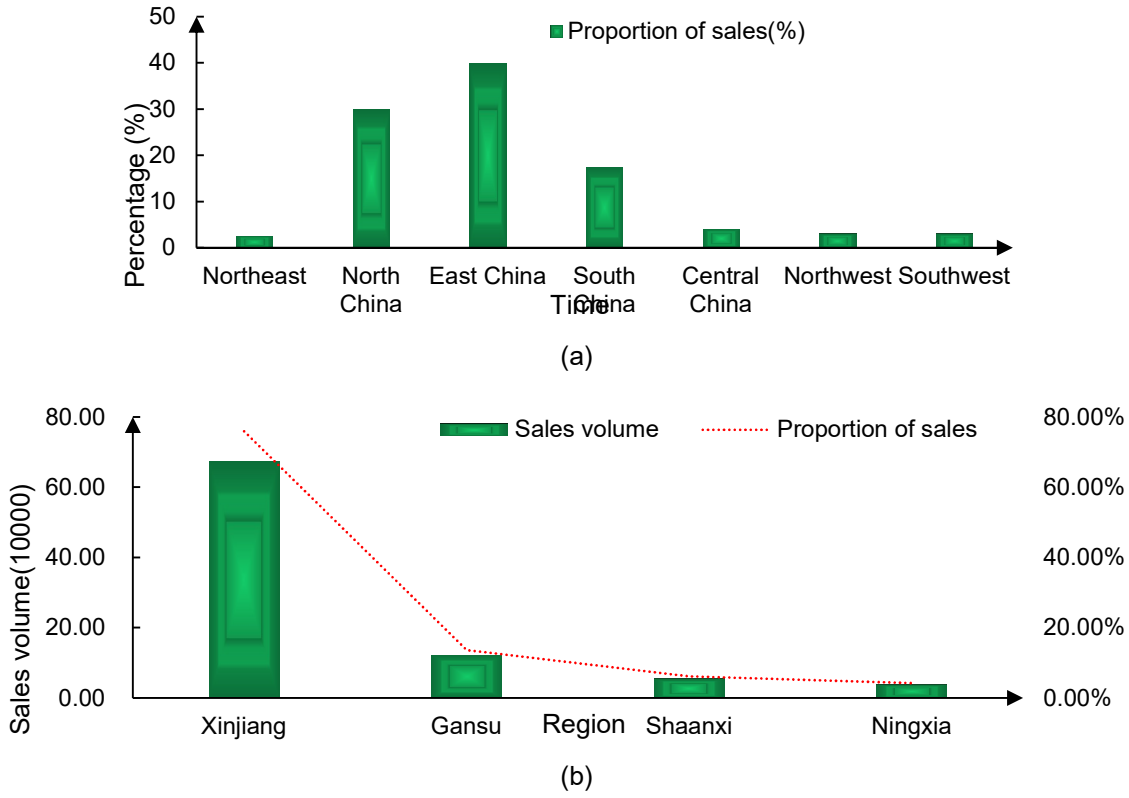

Figure 6: Sales data of special products in different regions of JD Mall in June 2016

In Figure 6, Figure 6 (a) describes the sales data of agricultural products in each region, and Figure 6 (b) describes the sales data of agricultural products in the northwest region. It can be learned from the figure that the proportion of specialty sales in East China was the highest at 40%, while that in Northeast and Northwest China was relatively low at 2.5% and 3% respectively. Based on the detailed analysis of the northwest region, it can be seen that its main proportion is in Xinjiang. In the northwest region, Xinjiang's advantages are obvious. Its sales volume is higher than that of other provinces in the region, which is closely related to Xinjiang's geographical environment. Xinjiang has abundant resources and sufficient sunshine. There is a large demand for fruits and dried fruits in the market and they are of good quality, so they are loved by people. However, Xinjiang has a vast territory and is far away from the vast consumer population. Therefore, in the harvest season, it is difficult for consumers to go directly to Xinjiang to purchase. The growth of e-commerce and modern logistics provides a new way for this problem. Local farmers open shops online, and consumers pay for goods online. Then the farmers mail the goods to consumers. Online e-commerce has solved people's geographical distance and brought buyers and sellers together. Both parties conduct capital transactions online, and then conduct physical transactions through express delivery. Therefore, fruit farmers and fruit owners in Xinjiang all like online e-commerce, which gives them a great opportunity to increase their income. They are also committed to joining the Internet platform. JD's data also confirmed this view. The main products in Xinjiang are dried fruits, nuts, etc. However, it should also be noted that JD.com does not have much investment or market share in Xinjiang at present, otherwise the dried fruit sales market in Xinjiang would not be so small. It can be learned from this that the sales volume of e-commerce agricultural aid in local specialties is still very regional.

IV. Conclusions

For farmers, the improvement of living standards is the first. Hiwever, more importantly, they should sell their labor results to other areas in the city, so that they can get real benefits, which is the focus of targeted poverty alleviation. Of course, from the fresh sales data of JD.com, e-commerce still has a lot of room for development in the current agricultural products. Although most of them are companies, they are mainly agricultural products and basic products. Even if they are not directly traded with farmers, they can still profit from them, but they are not directly profitable. For small and medium-sized farmers and agriculture-related businesses, they can choose appropriate platforms and marketing methods according to their actual conditions. If they have certain experience and sufficient resources, they can sell through Taobao or "T+1" to obtain higher profits. If they don't have enough experience and the surrounding environment is not very good, then they can directly build a platform to avoid future losses.

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