

Differences in Online Sales of Agricultural Products from the Perspective of Farmers

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Abstract: The development and popularization of network technology and the gradual rise of network sales of agricultural products not only provide a good opportunity for farmers engaged in the sale of agricultural products, but also play a role in promoting the development of agricultural products sales. In this paper, based on the micro-survey data of typical e-commerce village farmers, the differences in the effect of online sales of agricultural products on income increase are studied from the perspective of different types of agricultural products. The results show that the online sales of fresh and dry agricultural products can improve the household income of farmers, and the latter's income-increasing effect is stronger than the former, mainly because of the differences in characteristics of agricultural products, operating costs and value appreciation. In order to further improve the income-increasing effect of online sales of agricultural products, the government should continue to promote the construction of software and hardware infrastructure of online sales of agricultural products in rural areas, such as network, transportation, cold chain and warehousing, encourage the innovation of packaging technology, and create a good online sales environment for farmers in more areas. At the same time, efforts should be made to promote the branding, quality and value of agricultural products, guide farmers to produce high-quality agricultural products, and support competent farmers to carry out agricultural product processing.

Keywords: Farmers, Agricultural products, Internet.

1. Introduction

Online sales can help farmers break through the geographical, time, information and other restrictions, broaden the sales channels of agricultural products, and accurately connect with the market. With the development and upgrading of logistics infrastructure and the rise of new e-commerce platforms and new retail platforms, more and more farmers have begun to participate in the uplink of agricultural products. Moreover, compared with the dry agricultural products which started earlier, the penetration rate of fresh agricultural products has gradually increased. Scholars such as Zeng Yiwu [1], Ge Jihong [2], Cheng Xinwei [3], Zan Mengying [4], Han Jie [5], Lu Zhaoyang [6], Mueller R [7] and Satoh T [8] have all confirmed that online sales of agricultural products can help farmers' families to increase their income, but no scholars have studied the difference of income-increasing effect of online sales of agricultural products from the perspective of different agricultural products. In this context, studying the differences in the effect of online sales of fresh and dry agricultural products and finding the main reasons for the differences helps to take accurate countermeasures to promote the development of agricultural e-commerce, so as to promote more agricultural products upward, increase the income of farmers and create conditions for the realization of common prosperity. At the same time, this study is helpful to deepen the understanding of the effect of the development of online sales of agricultural products and provide inspiration for the further development of online sales of agricultural products.

According to the domestic and foreign scholars' research on online sales of agricultural products, most of the existing studies are qualitative studies on the importance, existing

problems and suggestions of online sales of agricultural products, and there are few literatures on the income increase effect of online sales of agricultural products, and even fewer systematic and empirical studies are conducted from the perspective of farmers. Moreover, no scholars have conducted a differential discussion on the income increase effect of online sales of different types of products. Therefore, in this paper, an empirical study is made from the perspective of farmers on the differences in the effect of online sales of different types of agricultural products to observe the differences between fresh and dry agricultural products on the income of farmers' families. The research results can provide policy reference for the government to promote online sales of agricultural products, and also provide new ideas for cracking the phenomenon of "low prices for grain hurting the peasants" and improving the income of farmers' families, which is of great significance in both practical and theoretical aspects.

2. Theories and Methods

2.1. Theoretical Analysis

2.1.1. The Influence Mechanism of Online Sales on Farmers' Income Increase

According to the hypothesis of "rational economic man" in economics, farmers will pursue their own profit maximization. When the profit from online sales is greater than the profit from traditional entity sales, the farmers' enthusiasm to choose online sales will be greatly improved. Based on the research results of existing scholars, the internal logic of network sales and farmers' family income was analyzed from the sales channels, transaction costs, and product value (Fig 1).

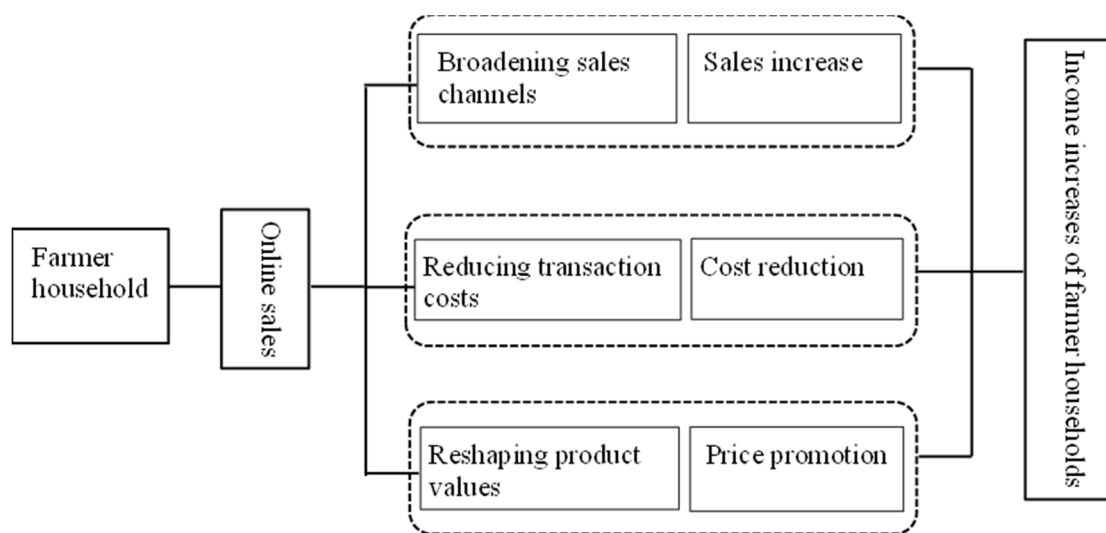


Figure 1. Internal logic of online sales and household income increase

2.1.1.1 Reform of agricultural products sales channels and income increase of farmer households

The development of network information technology has provided a new channel for the circulation of agricultural products, breaking the constraints of traditional agricultural products circulation channels on the time and place of transactions [9], because online sales have more transparent and streamlined trading links, a wider market space, and a large number of scattered supply and demand entities gather through the Internet compared with traditional circulation channels. Research shows that online sales can help farmers expand their existing market share and tap more new customer resources [10]. In addition, because the traditional sales channels are limited by regions and the market information is asymmetric, "small farmers" cannot grasp the real demand of the "big market" and are easy to fall into the slow-moving dilemma of difficult sales, while the oversupply is an important factor that leads to the low income of farmers [1]. Network helps to improve farmers' ability to collect and use information, which effectively makes up for farmers' information shortcomings and better guides production [11]. Farmers can understand the supply and demand information of agricultural products in the market through the network platform, adjust their production situation in time according to the market demand, realize accurate docking of supply and demand of agricultural products, avoid blind production of "low prices for grains hurting farmers", and help solve the problem of imbalance between supply and demand [12]. Therefore, online sales can effectively broaden the circulation channels of agricultural products and have a positive impact on the income increase of farmer households.

2.1.1.2 Reducing transaction costs of agricultural products and increasing household income

One of the core values of the Internet is to reduce the social transaction cost of agricultural products [13]. Traditionally, there are many links in the circulation of agricultural products that agricultural products go from the place of origin to the wholesale market through middlemen, and then to the sales terminal through middlemen, supermarkets or retail. The multi-link circulation will inevitably cause high costs. Different from traditional trading methods, online sales can complete the vertical integration of industrial chain, organize farmers with small scale, scattered management and weak self-marketing ability to enter the market, shorten the circulation chain, and enable farmers to directly face

consumers across intermediate links such as wholesalers and retailers. In this way, the timely and accurate information docking between the supply and demand sides enables agricultural products to enter the circulation field more quickly, reduces the excess loss caused by product backlog or surplus, reduces the inventory cost, transportation cost, information cost, time cost, risk cost and management cost of agricultural products sales to a certain extent, and improves the transaction efficiency [14]. Therefore, online sales can reduce the transaction cost of agricultural products and have a positive impact on the income increase of farmers.

2.1.1.3 Reshaping the value of agricultural products and increasing the income of farmer households

In the traditional trading mode, the sales of agricultural products often rely on middlemen, who have the monopoly advantage of information and location, making farmers basically have no voice. Therefore, middlemen often deliberately depress the purchase price of agricultural products to obtain high profits, resulting in the loss of farmers' income. Through network sales, buyers and sellers can be directly matched, and middlemen are excluded from distribution channels, which is conducive to improving the dominant position of farmers in the market [15]. The network channel enables farmers to get rid of the low-price acquisition of agricultural products by middlemen, thus increasing the profit space of agricultural products sales. With the development of online sales, the competition in the online market is gradually increasing, but excessive competition may harm the interests of some farmers, while moderate competition helps to force industrial upgrading, which provides the possibility for reshaping the value of agricultural products. Fierce market competition and real consumer demand prompt farmers to change the previous mode of simply selling original products online and begin to pay attention to the quality, added value and consumption experience of agricultural products, strive to achieve product standardization, operation specialization and service quality, and constantly improve the quality and reputation of agricultural products, thus forming a group of consumers with high viscosity. Therefore, online sales can promote the reshaping of the value of agricultural products and have a positive impact on the income of farmers.

2.1.2. Heterogeneity of Agricultural Products Online Sales Helping Farmer Households' Income Increase

Theoretically, the online sales of agricultural products have a positive impact on the household income increase. But in reality, different types of agricultural products have great heterogeneity in product characteristics, production characteristics and market transaction characteristics, especially fresh and dry agricultural products, which makes the circulation process and mode of agricultural products linking production and consumption and the way to realize added value in the circulation process different. In addition, this heterogeneity will give birth to the difference of digital dividend under the cyclic cumulative effect of the scale of network market and the promotion of consumer demand [16]. Therefore, the income-increasing effect of online sales of agricultural products cannot be generalized simply, because different types of online sales of agricultural products have different promotion effects on household income. In order to make online sales benefit farmers, consumers and the whole agricultural industry better, it is necessary to fully consider the heterogeneity of different types of agricultural products, take targeted development measures, and constantly optimize the development model, so as to better enhance the promotion effect of online sales of agricultural products on farmers' household income.

2.2. Methodology

To examine the online sales of different types of agricultural products and their differences in household income, the research group designed a questionnaire with fresh and dry agricultural products as the research object from the micro perspective of farmers, and conducted a survey on typical e-commerce villages in Jinhua, Wenzhou and Lishui in Zhejiang province from September to October 2019. In this survey, questionnaires, symposiums, and in-depth interviews with people familiar with the situation were conducted among the farmers through random household visits. The questionnaires were completed by the surveyed farmers themselves or based on the investigators' questions about the farmers. A total of 180 questionnaires were distributed and 156 were recovered, with a recovery rate of 86.67%, of which 144 were valid and the effective rate was 92.31%. In the valid sample, the number and proportion of sales of different

agricultural products are mainly as follows: 45 farmers engaged in online sales of fresh agricultural products and 99 farmers engaged in online sales of dry agricultural products, accounting for 31.25% and 68.75% respectively.

From the overall survey data, 72.78% of the surveyed farmers are male, with an average age of about 52 years old and an average total family population of about 4. The educational level of the surveyed farmers is 93.01% in senior high school and below, among which 15.31% in senior high school, 26.47% in junior high school and 51.23% in primary school and below.

Based on the analysis of the mechanism of agricultural products online sales on farmers' family income, in this paper, the survey data will be used to further analyze the effect of increasing income brought by online sales of fresh and dry agricultural products and the difference between them.

3. Conclusion

3.1. Comparison of Online Sales of Fresh and Dry Agricultural Products

3.1.1. Online Sales of Fresh and Dry Agricultural Products.

According to the average sales of farmers engaged in online sales of agricultural products, the average sales before farmers engaged in online sales of fresh and dry agricultural products were 175,300 yuan and 1,846,700 yuan respectively, while the average sales of farmers after that in 2018 were 429,300 yuan and 2,547,600 yuan respectively, as shown in TABLE I. In terms of sales growth rate, as of 2018, the average growth rate of farmers engaged in fresh agricultural products reached 144.89%, while that of farmers engaged in dry agricultural products was 37.95%, which was 106.94% higher than that of farmers engaged in dry agricultural products. The analysis shows that online sales promote the sales of fresh and dry agricultural products, and the sales growth rate of farmers engaged in fresh agricultural products is relatively higher than that of dry agricultural products. With the gradual improvement of logistics and other infrastructure, the emergence of modern circulation mode has made it possible for the online sales of fresh agricultural products, and witnessed the very strong development momentum of the online sales of fresh agricultural products.

Table 1. Sales amount of farmers before engaging in online sales and sales amount in 2018 (RMB 10,000 Yuan)

| VARIABLE NAME | FARMERS ENGAGED IN ONLINE SALES OF FRESH AGRICULTURAL PRODUCTS | | Farmers engaged in online sales of dry agricultural products | |
|---------------------------------------|--|------------------------|--|------------------------|
| | Amount | Valid samples (pieces) | Amount | Valid samples (pieces) |
| SALES BEFORE ENGAGING IN ONLINE SALES | 17.53 | 27 | 184.67 | 42 |
| SALES IN 2018 | 42.93 | 45 | 254.76 | 99 |

Note: Data are derived from questionnaires

3.1.2. Investment and Parcel Expenses for Online Sales (Or Online Stores) Of Fresh and Dry Agricultural Products

According to farmers' investment in online sales of agricultural products (or online stores) in 2018, the average farmers' total logistics investment in online sales of fresh and dry agricultural products was 33,100 yuan and 143,900 yuan respectively, and the average farmers' total product packaging

investment in online sales of fresh and dry agricultural products was 1,566,900 yuan and 53,400 yuan respectively, the average farmers' total investment in third-party services for online sales of fresh and dry agricultural products (or online stores) was 15,000 yuan and 28,100 yuan respectively, and the average farmers' total investment in online goods and online store operation and promotion for online sales of fresh and dry agricultural products (or online stores) was 88,500

yuan and 288,500 yuan respectively, as shown in TABLE II. The analysis shows that the online sales of fresh agricultural products have relatively high investment in product packaging, which is also confirmed in the investigation process, because fresh agricultural products need more packaging costs than dry agricultural products. However, the investment in logistics, third-party services, online goods and online shop operation and promotion of dry agricultural products online sales is relatively high.

From the package cost of farmers engaged in online sales of agricultural products (or online stores), the average cost of mailing a parcel for farmers engaged in online sales of fresh

and dry agricultural products in the first year was 9.23 yuan and 8.48 yuan respectively, and that in 2018 was 8.23 yuan and 6.23 yuan respectively, as shown in TABLE III. It is obvious that compared with the first year, in 2018, the average cost of mailing a parcel for the average farmer engaged in online sales (or online stores) of fresh and dry agricultural products decreased by 10.83% and 26.53%, respectively, and the decrease rate of parcel cost of fresh agricultural products was 15.70% lower than that of dry agricultural products. Data analysis shows that, on average, it is relatively cheap for farmers to mail a parcel for online sales (or online stores) of dry agricultural products.

Table 2. Comparison of farmers' investment in online sales of agricultural products (or online stores) (10,000 yuan)

| Variable name | Farmers engaged in online sales of fresh agricultural products | | Farmers engaged in online sales of dry agricultural products | |
|--|--|---------|--|---------|
| | Valid samples (pieces) | Average | Valid samples (pieces) | Average |
| Total logistics expenses in 2018 | 27 | 3.31 | 94 | 14.39 |
| Total expenditure on product packaging in 2018 | 13 | 156.69 | 96 | 5.34 |
| Total expenditure of third-party services in 2018 | 16 | 1.5 | 59 | 2.81 |
| Total expenditure on operation and promotion of online goods and online stores in 2018 | 15 | 8.85 | 60 | 28.85 |

Note: Data are derived from questionnaires

Table 3. Average logistics parcel expenses of farmers engaged in online sales of agricultural products (or online stores) (RMB)

| Variable name | Farmers engaged in online sales of fresh agricultural products | | Farmers engaged in online sales of dry agricultural products | |
|---|--|---------|--|---------|
| | Valid samples (pieces) | Average | Valid samples (pieces) | Average |
| Average logistics parcel fee for the first year | 43 | 9.23 | 99 | 8.48 |
| Average logistics parcel fee in 2018 | 43 | 8.23 | 99 | 6.23 |

Note: Data are derived from questionnaires

3.1.3. Brand Building of Fresh and Dry Agricultural Products

Judging from the brands of fresh agricultural products sold online, 17.78% have their own registered brands, 17.78% have county-level public brands, 2.22% have city-level public brands, and 62.22% have no brand. Judging from the brands of dry agricultural products sold online, 36.36% have their own registered brands, 20.20% have county-level public brands, 2.02% have city-level public brands, 19.19% have brands registered by others, and 22.22% do not have any brands, as shown in TABLE IV. It is obvious that the

proportion of farmers selling dry agricultural products with their own registered brands is 18.58% higher than that of fresh agricultural products, and the proportion of farmers selling dry agricultural products with county-level public brands is 2.42% higher than that of fresh agricultural products. In addition, no fresh agricultural products sold online have brands registered by others. The analysis shows that the branding of dry agricultural products sold online is relatively high, in which the brands registered with others are the main ones, while the branding of fresh agricultural products sold online is relatively low, and most fresh agricultural products have no brands, and their value increment is relatively low.

Table 4. Brands of fresh and dry agricultural products sold online (%)

| Valid sample (pieces) | Fresh agricultural products | | Dry agricultural products | |
|-----------------------------|-----------------------------|------------|---------------------------|------------|
| | Frequency | Percentage | Frequency | Percentage |
| Self-registered brand | 8 | 17.78 | 36 | 36.36 |
| County-level public brand | 8 | 17.78 | 20 | 20.20 |
| City-level public brand | 1 | 2.22 | 2 | 2.02 |
| Brands registered by others | / | / | 19 | 19.19 |
| No brand | 28 | 62.22 | 22 | 22.22 |

Note: Data are derived from questionnaires

3.2. Differences in the Effect of Increasing Income from Online Sales of Fresh and Dry Agricultural Products

3.2.1. Analysis of Household Income of Farmers Engaged in Online Sales of Fresh Agricultural Products

The data analysis shows that the household income after engaging in online sales of fresh agricultural products is higher than that before. The average household income of farmers before engaging in online sales of fresh agricultural products was 89,800 yuan, and that in the first year after engaging in it was 99,600 yuan, an increase of 9,800 yuan and a growth rate of 10.91%. In 2018, the average household income of farmers selling fresh agricultural products online was 157,000 yuan, an increase of 67,200 yuan and a growth rate of 74.83%, and an increase of 57,400 yuan and a growth rate of 57.63% compared with the first year. In the first year, the average income of farmers selling fresh agricultural products online was 55,800-yuan, accounting for 62.14% of their total household income on average. In 2018, the average online income of farmers selling fresh agricultural products

was 72,500-yuan, accounting for 46.18% of their total household income on average. The average income of farmers selling fresh agricultural products online in the first year accounted for 15.96% higher than that in 2018, as shown in TABLE V.

Data analysis shows that from the average household income of farmers engaged in online sales of fresh agricultural products, online sales have brought an increase in household income. From the time when farmers are engaged in online sales of fresh agricultural products, the contribution rate of farmers to household income is relatively low at the initial stage of online sales of fresh agricultural products, and it increases with the extension of operating time. That is to say, under other conditions unchanged, the longer farmers are engaged in online sales of agricultural products, the greater their contribution to household income. Thus, it is clear that the time to start selling fresh agricultural products online is an important factor affecting the household income of farmers. In addition, the online sales revenue has a higher contribution rate to the household income of farmers engaged in online sales of fresh agricultural products.

Table 5. Household income of farmers engaged in online sales of agricultural products (10,000 yuan)

| Variable name | Farmers engaged in online sales of fresh agricultural products | | Farmers engaged in online sales of dry agricultural products | |
|--|--|--------|--|--------|
| | Valid sample (pieces) | Amount | Valid sample (pieces) | Amount |
| Household income before engaging in online sales | 42 | 8.98 | 99 | 32.01 |
| Household income in the first year | 45 | 9.96 | 99 | 33.75 |
| Online sales revenue in the first year | 40 | 5.58 | 99 | 14.37 |
| Household income in 2018 | 45 | 15.70 | 97 | 42.86 |
| Online sales revenue in 2018 | 44 | 7.25 | 96 | 31.21 |

Note: Data are derived from questionnaires

3.2.2. Analysis of Household Income of Farmers Engaged in Online Sales of Dry Agricultural Products

The data analysis shows that the household income after engaging in the network sales of dry agricultural products is higher than that before. The average household income of farmers before engaging in online sales of dry agricultural products was 320,100 yuan, and that in the first year after engaging in it was 337,500 yuan, an increase of 17,400 yuan and a growth rate of 5.44%. The average household income of farmers selling dry agricultural products online in 2018 was 428,600 yuan, an increase of 108,500 yuan and a growth rate of 33.90%, and an increase of 91,100 yuan and a growth rate of 26.99% compared with the first year. In the first year, the average income of farmers selling dry agricultural products online was 143,700-yuan, accounting for 42.58% of their total household income on average. In 2018, the average online income of farmers selling dry agricultural products was 312,100-yuan, accounting for 72.82% of their total household income on average. The average income of farmers selling fresh agricultural products online in 2018 accounted for 30.24% higher than that in the first year, as shown in TABLE V.

Data analysis shows that from the average household income of farmers engaged in online sales of dry agricultural products, online sales have brought an increase in household income. From the time when farmers are engaged in online sales of dry agricultural products, the contribution rate of

farmers to household income is relatively low at the initial stage of online sales of dry agricultural products, and it increases with the extension of operating time. Thus, it is clear that the time to start selling dry agricultural products online is an important factor affecting the household income of farmers. In addition, the online sales revenue has a higher contribution rate to the household income of farmers engaged in online sales of dry agricultural products.

3.2.3. Comparison of Household Income Differences Between Online Sales of Fresh and Dry Agricultural Products

In terms of total income, the household income of farmers engaged in the sale of dry agricultural products is higher than that of those engaged in the sale of fresh agricultural products. The household income of farmers before engaging in the online sales of dry agricultural products, the household income of the average online sales of dry agricultural products in the first year, and the household income of the average online sales of dry agricultural products in 2018 are respectively 230,300 yuan, 237,900 yuan, and 271,600 yuan higher than those of farmers before engaging in the online sales of fresh agricultural products, the household income of the average online sales of fresh agricultural products in the first year, and the household income of the average online sales of fresh agricultural products in 2018, with a small change in the difference. The average online income of

farmers selling dry agricultural products in the first year and the average online income of farmers selling fresh agricultural products in 2018 are 87,900 yuan and 239,600 yuan higher than those of farmers selling fresh agricultural products in the first year and 2018 respectively, with a large change in the difference. Thus, it is clear that with the increase of business hours, the driving effect of online sales on the sales of dry agricultural products is more obvious.

In terms of growth rate, compared with the previous year, the average growth rate of household income in the first year of the network sales of fresh agricultural products is 5.47% higher than the growth rate of household income in the network sales of dry agricultural products. Compared with the first year, the average income growth rate of farmers engaged in online sales of fresh agricultural products in 2018 is 30.64% higher than that of farmers engaged in online sales of dry agricultural products. The average online income from online sales of fresh agricultural products in the first-year accounts for 19.56% higher than that from online sales of dry agricultural products. The average network income from the network sales of dry agricultural products in 2018 accounts for 26.64% higher than that from the network sales of fresh agricultural products. Compared with the first year, by 2018, the growth rate of online income of farmers engaged in online sales of dry agricultural products is 14.28% higher than that of farmers engaged in online sales of fresh agricultural products. Thus, it is clear that from the perspective of the proportion of online income to household income, the contribution rate of online sales of agricultural products to the household income of farmers engaged in online sales of fresh agricultural products in the first year of development is relatively high, and the contribution rate of online sales of dry agricultural products to the household income of farmers in 2018 is relatively high.

3.3. Conclusions and Enlightenment

Online sales, as an important application of information technology, can help farmers to bypass middlemen and directly connect with consumers, which not only reduces the circulation link, but also promotes the collection of market information and reshaping the value of agricultural products. The research based on survey data shows that the online sales of fresh and dry agricultural products can improve the household income of farmers, and the effect of online sales of dry agricultural products is stronger than that of online sales of fresh agricultural products.

Based on the impact mechanism of household income increase, the main reasons for the difference between fresh and dry agricultural products online sales on household income increase are as follows: First, the difference in product sales. Online sales can broaden the sales channels of fresh and dry agricultural products and increase their sales. However, they have different logistics requirements for storage, transportation and distribution, and dry agricultural products are easier to store and transport. Although the sales growth rate of fresh agricultural products is much higher than that of dry agricultural products, there is still a big gap between them in absolute terms. According to the investigation, the after-sales problems of fresh agricultural products are more than those of dry agricultural products, and the losses are larger, which affects the sales growth to a certain extent. Second, the difference in operating costs. Compared with dry agricultural products, fresh agricultural products are bulky and perishable. Therefore, the investment cost of online sales of fresh

agricultural products (or online stores) is higher than that of dry agricultural products, especially in product packaging. In addition, the average cost of mailing a parcel of fresh agricultural products is higher than that of dry agricultural products. Third, the difference in value added. Because of the relatively high degree of branding of dry agricultural products, farmers sell more branded products. Although most of them are rough processed products, they also increase the added value of agricultural products to a certain extent. However, fresh agricultural products have some problems, such as difficult standard control in the production process, uneven quality of farmers' agricultural products, slow branding process, and low product premium and income increase.

The above basic research facts show that online sales is an effective way to increase farmers' income. First of all, the government should vigorously promote the construction of software and hardware infrastructure for the network sales of agricultural products in rural areas, such as network, transportation, cold chain and storage, so as to enable more farmers to have the conditions to carry out the network sales of fresh agricultural products, thus opening up the network sales channels of fresh agricultural products, easing the upward difficulty and the last kilometer problem of fresh agricultural products, and promoting the increase of farmers' income. Secondly, the government should focus on stimulating the development vitality of market players in the circulation field, encourage the innovation of packaging technology, reduce the use of disposable packaging, and effectively solve the problems of high packaging cost and serious loss of fresh agricultural products. Third, the government should strive to promote the construction of brand, quality and value of agricultural products, continuously improve farmers' awareness of brand of agricultural products, guide farmers to produce high-quality agricultural products, and encourage and support farmers with the ability to carry out agricultural products processing, and process some fresh agricultural products into dry agricultural products to not only break through the seasonal constraints of agricultural products but also increase the added value of products, effectively increasing farmers' household income. Finally, the government should actively train online sales personnel for agricultural products, increase training for farmers and improve their ability to use the Internet to drive product sales. On the whole, online sales of agricultural products can play a huge potential, effectively promote the upward movement of agricultural products, and realize the continuous growth of farmers' household income on the basis of appropriate government support for online sales of agricultural products, relying on local product advantages and broad market demand.

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