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Rural Transformation through E-commerce in China:
Opportunities and Constraints for Small Farmers

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Rural Transformation through E-commerce in China: Opportunities and Constraints for Small Farmers

Libin Wang¹

Abstract

Since the economic reform of China in 1978, the agriculture has made significant achievements and contribution to the national economic development. However, the PRC's agricultural management system is symbolized as "small size", "highly scattered". Family operations mainly focus on the production stage while neglecting services along the value chain, which caused the high production costs, low benefits, and farmer's disadvantaged status in market competition. With the fast development the Internet technology in China, the Internet has shown great advantage in terms of integrating, transforming and upgrading the agricultural food and value chain. The PRC Government has issued several policies and pilots to enhance the use of internet technologies as a means to transform and integrate the rural economy.

The integration of Internet with different industries has brought great influence on the economic structure and the innovation system. In PRC, the integration of internet with the agricultural sector is deepening. In 2016, there are 24 provinces and 31 cities that set up exhibition areas on the Alibaba e-commerce platform. On TaoBao e-commerce platform, there are 1,630,000 stores at village and town level engaged in agricultural products online. The internet is becoming a new motivation of economic growth in rural areas. E-commerce is changing farmers' role in the agriculture and food value chains, the business models, as well as the development of rural economy and society.

This paper reviewed the social, economic, and political background which has driven the development of e-commerce in China. In addition, this paper, which is based upon the field surveys in five provinces of China, indentified that the main opportunities and constraints that the farmers face in front of E-commerce. The main opportunities that the E-commerce brought to farmers include:

- 1. Changed the sales pattern of agricultural products and expand sales channels*
- 2. Facilitated rural economic transformation and upgrading*
- 3. Promoted the collectivization and systematization of farmers*
- 4. Provided job opportunities to farmers and disadvantaged groups*
- 5. Provided entrepreneurial opportunity to returnees from migration, young people graduated from schools and the unemployed graduates*
- 6. Provided the opportunities for training and capability building*
- 7. Provided the new business development opportunities*

Since the economic reform of China in 1978, the agriculture has made significant achievements and contribution to the national economic development. However, the PRC's agricultural management system is symbolized as "small size", "highly scattered". Family operations mainly focus on the production stage while neglecting services along the value chain, which caused the high production costs, low benefits, and farmer's disadvantaged status in market competition. With the fast development the Internet technology in China, the Internet has shown great advantage in terms of integrating, transforming and upgrading the agricultural food and value chain. The PRC Government has issued several policies and pilots to enhance the use of internet technologies as a means to transform and integrate the rural economy.

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1 Introduction

The integration of Internet with different industries has brought great influence on the economic structure and the innovation system. In PRC, the integration of internet with the agricultural sector is deepening. In 2016, there are 24 provinces and 31 cities that set up exhibition areas on the Alibaba e-commerce platform. On TaoBao e-commerce platform, there are 1,630,000 stores at village and town level engaged in agricultural products online. The internet is becoming a new motivation of economic growth in rural areas. E-commerce is changing farmers' role in the agriculture and food value chains, the business models, as well as the development of rural economy and society.

This paper reviewed the social, economic, and political background which has driven the development of e-commerce in China. In addition, this paper, which is based upon the field surveys in five provinces of China, identified that the main opportunities and constraints that the farmers face in front of E-commerce.

The Positive Impacts of Internet+ on Farmers and New Agricultural Operators

During the field research, it is discovered that Internet has brought huge positive impacts on farmers and new agricultural operators. Specifically, Internet provides opportunities over change of sales pattern of agricultural products, increase of farmers' income, and rural economic transformation and upgrading.

1.1 Change the sales pattern of agricultural products and expand distribution channel

E-commerce platform plays a positive role in solving the conflicts between agricultural products couldn't be sold and consumers find nowhere to buy what they need. It also helps expanding distribution channel of agricultural products and increasing farmers' income, especially for remote and less accessible areas.

Changgou, Jifeng town, Cheng County, Gansu Province is located in remote mountain area. Before e-commerce is widely used, farmers sold their products by shouldering to the town 20km away or even farther. Even though, products might not be sold and farmers were living poor. In 2013, local officer Xuan Zhang established "Jifeng Local Specialty" on Taobao with the help of local Committee of Communist Party of China; 30 different categories products are sold on line, including eggs, honey and walnut. In 2014, Xuan Zhang developed the cage-free feeding pattern for free-range chicken. Over 10 thousand chickens were soon sold out with price 20% higher than market average. Later, Xuan Zhang became the associate officer of the town and helped farmers in the county creating e-shop. Till now, 27 administrative villages in the town have 34 e-shops on Taobao and 42 e-shops on Wechat in total. The town has realized e-commerce for all local products.

In Yuan town, Yunnan county, 80% of the area is covered with mountain. Because of the inconvenience of transportation, low demands for products and other factors, there was no marketing channel for products such as walnuts and wild game. With the development of Internet economy, HaoHai Media Ltd. took advantage of Yuan town *Tongcheng* direct and distributional e-commerce platforms to sell walnuts and other local products online. Agencies have been established at some cities in China and now are trying to expand the agencies abroad. Some agricultural products have been sold to Laos, Vietnam, Singapore, Malaysia, Thailand and Australia, and the sales online reached to RMB 300 thousand.

1.2 Facilitate rural economic transformation and upgrading

1.2.1 Transform local agricultural resources and products advantages into economic opportunities

It is discovered during the field research in 5 provinces that all have their distinguished agricultural resources and characteristic agricultural products. However, some characteristic agricultural products have smaller cultivated area and lower yield, and thus hard to realize mass scale agricultural products production base and form economies of scale. Therefore, under traditional sales pattern, economic benefits are hard to realize. The application of Internet solves such problem.

Take Gansu Province for example: Because of the long and narrow land area, scattered variety of agricultural products, small cultivated area and low production, economies of scale are difficult to realize. However, agricultural products of Gansu have the advantages of variety, high quality and specialty. Customers online value more about quality and specialty and are with diverse demands, however, have lower demands for each category. E-commerce platform could successfully avoid all the negative factors when selling Gansu agricultural products and makes use of its resources and products advantages, and transform such advantages into economic opportunities. Qi Liu, focal point of e-commerce service station at Dacaoan village, Cheng County, Gansu Province, established “Gansu people specialty shop” online and helped farmers selling agricultural products nationwide, including walnuts, pepper, agaric, wild plants which were almost impossible to sell.

During the field research, we found that there are many successful cases of selling specialty online. Another case is Chang zongzi of Suichang, Zhejiang Province. People from Suichang work away from hometown in many cities in China and they miss their hometown food so much. “Ganjie Wang” sells Chang zongzi nationwide via Internet, after mass and standardized production.

1.2.2 Incorporate farmers into green and high quality product production system

Different from offline sales, agricultural products sold online are with better quality and higher price, and targeted at middle to high-end consumers. What those consumers need is green pollution-free food and thus force agricultural products to be standardized and safe produced with high quality. For instance, Xuan Zhang, the associate officer of Jifeng county, said that the e-shop she operates has signed contracts with farmers: farmers need to promise that local honey sold online would be additive-free, range-free chickens should be fodder-free, and walnuts should be pesticide-free. Only after having been confirmed green pollution-free, could they be labeled the brand of Xuan Zhang’s shop and then to be sold. Once found the farmers haven’t produced as contract read, Xuan Zhang’s e-shop will terminate their cooperation. With the restriction of Xuan Zhang’s contract, farmers will comply with the agreement to operate green production to sell their products.

Major business of Suichang Mei River ecological farm specialty grocery store in Zhejiang Province is to sell agricultural products. The store rents all land area in Jinzhu village nearby to establish ecological farm. Farmers plant the crops at their own land by following the production plan and requirements raised by the store. The store also provides seeds and young plants. Farmers deliver the agricultural or livestock products to the store as required and the store then will sell via e-commerce shop. The sales pattern is Boutique Order mode, to deliver organic agricultural products to customers. There is monitoring equipment at ecological farm, connected with electronic screen at the front gate of grocery store on which all the production scenes at the farm are broadcast real time.

1.2.3 Include farmers into full industry chain

Farmers are usually in the production link in the industry chain, with the character of low profits and weak status. With the development of e-commerce, farmers could plant agricultural products as well as participate categorizing, processing, packaging, transporting, purchasing and selling of agricultural products. Farmers are not only embedded comprehensively into the full industry chain, but also share benefits from these links in the industry chain and increase the profits. Major business of Legend Parking at Guangshui, Hubei Province is to sell succulent plants online. The company has formed the one-stop service business model by including planting, packaging and selling all together. Farmers could participate in any procedure of the chain so that not limited to planting only. Legend Parking established succulent planting base over 50 thousand mu at Quanshui village, Changling town. Farmers could choose to work at the base to plant succulent, or to work at the packaging workshop. There are about 300 to 400 employees in the packaging workshop, and 90% of them are women from village nearby. They will be working on packaging succulent according to the orders, and earn RMB3000 on average per month.

Combining agriculture with tourism via Internet also expands marketing channel of agricultural products and extends the agriculture industry chain. Take Suichang of Zhejiang Province for example. At Gaoping new village, Suichang, the whole village is now dedicating to develop rural tourism. According to the President of Rural Tourism Association, the government helped establishing the “Rural Tourism Online” platform. Via “Rural Tourism Online”, shop owners could communicate with each other, such as introducing customers, promoting specialties and sharing experience conveniently. “Rural Tourism Online” platform will publish detailed information about rural tourism, and customers could order rural tourism products online or over the phone. Tourism could promote sales of local specialties, pork, mutton, tea and wild plants. The combination of agriculture and tourism also largely increases farmers’ income. In busy season, farmers now could earn RMB15,000 at least and a hundred thousand RMB at most. They could also choose to work away from home at the time of tourist off-season.

1.2.4 Accelerate the brand building of agricultural products

As for formal e-commerce platforms, products sold at platforms should have their brands, thus accelerating the brand building of local agricultural products. Take Yunan Chenxiao Commerce and Trade Ltd. at Jinghong for example, after having started e-commerce operation in 2013, it registered the brand as “Ban Na Ren” and produced series of products including black sugar, honey, tea and wild boar meat. The company opened up the market via Internet and brand building, and the sales of e-commerce platforms reached RMB 10.64 million.

Since the start-up stage when Shandong Yimeng Mountain Ga La E-commerce Ltd. established e-commerce platform relying on the “Shan Ga La”, the company determined the brand marketing development strategy: to register the brand of “Yimeng Mountain Gala”, covering 30 categories including agricultural products, livestock and food. All the agricultural products met the quality criterion and sold online have been authorized to use the brand “Yimeng Mountain”. To guarantee the reputation of “Yimeng Mountain”, the company set restricted standards of stockpiling and inspection and testing. From seeding to harvest, the whole procedure is under monitoring. The company also delegated Qingdao Puni Company to conduct products testing to ensure every single product is green and pollution-free, so that providing confidence to the consumers about their products and seeking solitary ground for further development.

1.2.5 The application of IoT improves the modernization level of agriculture

Internet makes it possible to improve agricultural production efficiency by applying IoT. Currently, the IoT users are mainly big agricultural enterprises, whose motivation to use IoT is to replace labor cost in the long-term and better control the quality of agricultural products.

Jianfeng Huang, the farm owner of Pinghu Jianfeng family farm, operated 3800mu land area, and they mainly plant wheat and rice. The farm makes use of the Internet in many stages during production and processing: (1) Monitoring food dryer by internet, if dryers break, automatic warning system would send message to the phone; (2) installing video screen with GPS on tractors to remote monitor agricultural machinery drivers; (3) installing precision operation balance devices on tractors to flatten lands, and thus will be weeds-free. Or high-lying area could not be submerged and weeds will spread everywhere. On average, every mu could save RMB 20. (4) Purchasing 4 UAVs (unmanned aerial vehicles), mainly used for spraying pesticides, decrease labor and lowering cost. All the Internet application mentioned above have received government subsidy.

As for integration of resources, the farm is working together with Jintai Agricultural Financing Company, who possesses UAVs and could assist with each other, to start the “Longfeike Technology Ltd.” The counterpart is a big company focusing on pesticides, and will not mix water with pesticides to undermine the effect of pesticides. Therefore, the cooperation with Jintai will lower the cost of pesticides and meanwhile, the quality could be guaranteed. Another fertilizer company in Zhejiang Province also bought shares from this family farm and sold fertilizer sold to it with discount.

The farm hired four people to operate the four UAVs, three of whom are bachelor degree, and their works cover 1200 mu in total every day. The farmer owner will be serving with other big farm owners with UAV to spray pesticides this year, RMB 10 per mu, and expect to earn RMB 300,000. If pesticides are not sprayed, he is preparing to conduct waterway patrol, remote sensing, cabling and wedding pictures shooting.

Demonstration park of modern agricultural technology of Zhongyi Fruit Ltd. at Yiyuan county, Zibo, Shandong adopts a series of high and new technologies, including net house protected cultivation, the intelligent integration facility of irrigation and fertilization and imported dwarfing detoxification stocks. Specifically, the intelligent integration facility of irrigation and fertilization combines irrigation and fertilization and finds the optimized composition of water and fertilizer for crops in the soil to absorb. Irrigation and fertilization have realized automatic control, and compared to traditional methods, have saved more than 60% fertilizer and more than 80% pesticides, greatly decrease agricultural pollution. The 300 mu park could be well managed by only one person. The focal point of the park expressed the positive attitude toward the future of IoT, and believed that the application of IoT could lower cost and save more than 90% of the labor. In addition, the demonstration park established monitoring, report system, tasking and exchange center based on information and software. By using wireless measurement, it is easy to acquire the best growing condition and accurately locate where the problem is. With the help of precise calculation of big data, the previous onerous agricultural work turns into simple mouse clicking.

1.3 Development of E-commerce Promotes Collectivization and Systematization of Farmers

The development of e-commerce enhances the leading role of new agriculture operators, promotes the collectivization & systematization and improves market competitiveness of farmers. During online sales, agricultural products shall go through standardized production, processing, packing, branding, with certain product scale. Since a single farmer has hardly any sufficient capability to complete all these steps, they need to cooperate to establish cooperative, company, home farm or enterprise led by talents in rural areas. Meanwhile, e-commerce enterprises also need to cooperate with the cooperatives to organize production and supply of online goods.

For example, according to Zhang Yuquan, the shopkeeper of “Hanhuo Yicheng” service point in Caishenmiao Village, Yicheng City, Hubei Province, he set up Fruit & Vegetable Specialized Cooperative in Sep. 2016 because he was requested to do so by the e-commerce platform for improving both parties’ credibility and guaranteeing product supply when seeking for cooperation

with online shopping mall. He organized the original retailers for production, which increased the market competitiveness of farmers. The featured product of Chenxiao Commercial Trading Company, Hongjing City is the crossbred wild boar of wild boar and little ear pig, whose registered brand is “Wild Elephant Valley”. The huge product demand in online sales requested more farmers to raise pigs, therefore, the Company established 2 cooperatives a few years ago. The pigs shall be raised in farmers’ home according to the company’s breeding regulations, for example, they shall be raised as long as 14 months, with weight within 65 kg, etc., and purchased, after passing acceptance inspection, at the price of RMB 1000 per pig. So far, over 50 households helped to raise pigs, averagely having over 10 pigs per household, and a gross income of RMB 13,000 per person.

1.4 Provide Job Opportunities to Farmers and Disadvantaged Groups

Rural e-commerce industrial chain includes product manufacturing, processing, marketing, after-sales service, etc., from which, the positions are derived to make employment options of farmers to be more diversified and provide job opportunities to disadvantaged groups, for example, low income family, the disabled, the elderly and women, etc., in rural area, with less job opportunities and limited source of income.

By the end of 2015, the whole e-commerce industrial chain has directly or indirectly mobilized over 4120 poor people from Chengxian County, Gansu Province, to start businesses and obtain employment. There are 917 online stores countywide, among which, 85 are operated by low income family, and 350 has signed poverty alleviation and income increasing agreement with 3682 low income families to help to sell agricultural products, with sales amount of RMB 1,3702,000. Increasing income per capita of 31,000 poor people is RMB 442, making the poverty incidence is decreased from 25.4% in 2013 to 14.1%² by the end of 2015. All over the county, women operates 395 online stores, among which, 50 are set up by poor women, 16 women are included among 43 rural Taobao partners, 11 among 40 express logistics enterprises are set up by women, and over 3,600 women³ obtain employment in relevant e-commerce industry. In 10 rural Taobao service stations in Paosha Town, Chengxian County, Gansu Province, women, who are originally full-time housewives without work, account for 2/3, and Taobao storekeeper, the new job, is very appropriate to and welcomed by women who have to take account of both family and career. In Xintai City, Shandong Province, e-commerce helps 3,650 low income families, opens 870 online stores, and drives low income families to increase income of RMB 1580 per capita per month. Chuanqi Gardening, an internet enterprise of Guangshui City, Hubei Province, planted succulent plants on 530 mu transferring land of low income family in poverty alleviation villages of Caihe Town and suburb, which receives more than 100 poor people to obtain employment and helps over 30 low income families to overcome poverty. The company attracts 300-400 people to work in packing and sorting step, among which, women, who are originally housewives without work, account for 90% or so.

1.5 Provide Entrepreneurial Opportunity to Returnees, Young People Graduated from Schools and the Unemployed Graduates

The degree of education of returning migrant workers, young people graduating from middle school (surplus labor in poor family who cannot continue to enter a higher school after graduating from junior and senior middle school), and the unemployed graduates is higher than that of common farmer, and being comparatively young and capable to accept new things, they’re considered as the human sources with higher quality in rural development. During research, the case that migrant youth is attracted by e-commerce development to return to start businesses are frequently recognized. For example, Huang

2 From the materials provided by staff of Chengxian County E-commerce Center

3 From materials provided by Vice Chairman of Women’s Federation of Chengxian County

Keqiang, storekeeper of rural Taobao service station in Anjiacun Village, Longxi County, Gansu Province, is a returnee who has ever worked in Fujian for 8 years, as hotel receptionist, cargo deliveryman, etc. In rural Taobao partner recruitment of Longxi County in 2016, he became one of the first group of 3.0 mode rural Taobao partners, with monthly income of about RMB 3000. According to Huang Keqiang, he always worked outside, now finally came back to the place that he's familiar with, and he's so glad to find his favorite job while helping people in hometown. Similarly, Zuo Chenming, "King of Sweet Potato" from Xintai, Shandong Province, is a young man returning to start business after baking sweet potatoes for 12 years in Qingdao. He started to cultivate sweet potato seedlings by using the money earned when working outside, and sold them through Alibaba platform with average sales per year of about RMB 1 million. Meanwhile, based on his own storage tank, he can help the clients who plant the seedlings through online platforms such as Taobao, 1688, WeChat, etc., with sales amount of RMB 10 million/year, among which, 60% are from the online transaction with China Resources, and 40% from final consumption market.

E-commerce not only mobilizes the returnees to start businesses, also provide development opportunities to college-graduate village official. Wang Yunlong, the village official selected from "Fire Engineering" in Dongdu Town, Xintai City, started business with his classmates in Hunan to research on pepper and make chilli sauce, whose registered brand is "Dongdu Jiutai", with production permit, and also opened specialized enterprise shop in Taobao, which not only drove industrialization of agricultural products such as pepper, garlic, etc., also mobilized low income families to obtain employment. Nowadays, he has set up a food company limited, based on Kangwangtai Fruit & Vegetable Specialized Cooperative, to plant high-quality varieties such as nectarine, Tianhongzi hawthorn, highland red toona, Jinzhuizi Pear, etc., by adopting operation mode of company + base + farmer household + internet, which were sold to large-and-medium cities such as Beijing, Shanghai, Qingdao, etc., through e-commerce transaction platform such as Alibaba, Taobao, etc., with annual revenue to be about RMB 15 million and increasing income per household per year to be RMB 40,000.

1.6 Provide Opportunities for Training and Capability Building

All provinces pay much attention to training on officials in relevant departments, farmers and new agriculture operators during development of internet+ rural economy. Usually, the government will, in the way of purchasing service, entrust the e-commerce service enterprises and occupational training school to undertake the training task, and some e-commerce enterprises also organize training.

A specialized e-commerce training section is set up in "51ganjie.com" in Suichang, Zhejiang to cooperate with government agencies in demand of training. Government subsidy for training a preliminary e-commerce is RMB 500, and that for an advanced e-commerce is RMB 800. At present, "51ganjie.com" has signed e-commerce training strategic cooperation agreement with Zhejiang Province Human Resources and Social Security Department, aiming to cultivate 50,000 e-commerce talents, support 40,000 people to start businesses and promote employment of 150,000 people for Zhejiang Province within 5 years. Elementary and intermediate talent certificates shall be granted by Zhejiang Province Human Resources and Social Security Department after training and assessment.

Zhang Yuquan, a former worker in the assembly line of Foxconn, Shenzhen, from "Hanhua Yicheng" convenience service station of Yicheng City, Hubei Province, knew little about e-commerce, and learned multi-skills such as platform account setup, online sales, product and packing design, business negotiation skills, etc., through e-commerce training carried out by "Hanhua Yicheng", 2 months after which, he opened up the convenience service station. As the first public school of e-commerce training in Southwestern China, Gansu Longnan Teachers College plays an important role in training on e-commerce talents in Gansu Province, with huge influence. By far, the College has already trained over 3,000 students, making it to be the important base for rural e-commerce talent training all over the province.

1.7 Provide New Business Development Opportunities

The combination of internet and rural economy has injected fresh vitality to rural economy, and provided path for different economic operators to grasp new business opportunities and open up new businesses.

Li Jianping, online storekeeper from Yixin Village, Longxi County, Gansu Province, started to sell traditional Chinese medicine online from Aug. 2016, averagely having 5-6 orders per day, and monthly net income of about RMB 3,000. Meanwhile, he planned to expand the scale of online store and purchase large quantity of medical materials with high quality and stable supply, while, realized that it was impossible to purchase & sell them or expand in traditional mode, for the quality and quantity of supply being difficult to be guaranteed, and branding and logo of agricultural products being out of unified regulations. Therefore, he plans to set up cooperative to integrate resources and expand store scale, making more farmers to carry out transaction through cooperative website and collecting corresponding agency fee.

Cooperatives or enterprises with certain economic foundation aim at leisure agriculture, and plan to expand agricultural industry chain. Caixi Fruit and Vegetable Specialized Cooperative, Suichang, Zhejiang Province, intends to cooperate with one e-commerce company of Hangzhou to establish vocational village on kiwi planting base and develop folk tourism. Meixi Eco-agricultural Products Supermarket of Suichang also plans to make clients to contract a stretch of land or one tree, on which, fruit trees will be planted by farmers according to client demand after payment; Clients will see the growth situation through real-time monitoring video. Some agricultural enterprises focus on consumption demand on anti-season agricultural products, and intend to sell newly researched products in off season to obtain higher profits. For example, Zuo Chenming, “King of Sweet Potato” in Xintai, Shandong Province, intend to invest RMB 20 million to set up processing plant to make baking ice sweet potato, namely, freezing the sweet potato after being baked, which having the same taste with that of fresh baked ones if consumers eating according to the instruction book. The baking technology has already been solved by now.

1.8 Opportunities for Enjoying Social Service

1.8.1 Life Service

Internet ear makes it possible for farmers to do multiple daily things such as buying goods, booking railway tickets, paying utilities, depositing and withdrawing money in small amount, selling agricultural products, logistics & express transceiving, etc. without going out. According to Huang Keqiang, the storekeeper of Taobao Service Station in Anjiacun Village, Longxi County, Gansu Province, which mainly provides services such as online shopping, paying fees, booking tickets, remittance, post, etc., to villagers, and also provides exhibition and transaction platform for specialized agricultural products. Since the first month after being opened up on Nov. 5, 2016, the Station averagely helped farmers to buy a pesticide sprinkling can per day, and it is highly appreciated by the fellow villagers based on the purpose of “purchasing the most substantial things in the most favorable price”. Meanwhile, by insisting on the service philosophy of “home delivery by walking the last kilometer”, Huang Keqiang himself usually delivers the goods to the villagers’ home, with the farthest distance to be the hills 20 kilometers away. Furthermore, he also teaches them how to use and irregularly pay return visit to realize the service condition of products, and ask them what else needed to be bought.

1.8.2 Productive Service

Internet offers convenience to farmers and new agriculture operators to carry out production and realize government policies. For example, it is common to find that demand in machinery driver and customers is mismatching, which is solved by internet technology. In Guangshui City, Hubei Province, both customers and machinery drivers could download the Client of “Nongji Zhitongche” by using mobile phone to receive information such as agro-machinery working, maintenance, fittings supply, etc. Being a cooperative project carried out by Hubei Agricultural Bureau and China Mobile Hubei Company, it is applied to publish realistic and reliable information, which can be checked by users through scanning by mobile phone.

Huang Jianfeng, the owner of Jianfeng Farm, Pinghu City, Zhejiang Province, is able to directly recognize the latest information of project application in government sectors, through Farmer Mailbox APP, fill in and send out the application materials via computer without going to the government sectors in person. He also inquired on whether potato was able to be interplanted in greenhouse with the online experts, via “Zhibao Online”, who called back in the next day to teach planting technology. Suichang Enterprise Association E-commerce Service Co., Ltd., Zhejiang Province, sorts out state and local policy documents, including 27 fields in rural economy development, such as engaging in business, technology, market supervision, finances, etc., and sets up “QIJIA” official account, by connecting to which, the users are very easy and convenient to find out the policy documents they wanted.

1.9 The Chance to Enjoy E-commerce Public Service

The development of Internet has enabled farmers with e-commerce dreams and new agricultural operators to enjoy services such as relevant e-commerce skills training, product branding and package design. Established in 2013, Zhejiang Ganjie Corporation Limited focuses on rural e-commerce, mainly including upstream system of agricultural products, downstream system of consumer goods and training on public services. In terms of downstream system, Ganjie establishes village-level service station in rural areas, chooses station leaders in populated ones and teaches them how to help villagers make online purchases, offer micro-loans, provide social services, such as paying utility bills, and solve the last kilometer logistical problems. In terms of upstream system, Ganjie mainly engages in package design, logistics, basic-level product quality control and marketing. It also promotes online sales on its self-built mobile shopping platform, combined with rural tourism. Targeting cooperatives and large-scale farmers as partners, Ganjie visits planting and breeding bases for on-field inspections to confirm whether products meet online sales standard and customers’ demand, reach certain scales, can be packaged and transported. After deciding which product to target during inspection, it negotiates with their focal points on details such as package design and product branding. In addition, Ganjie organizes a 10-person quality control group to set up business standards for main agricultural products in Suichang based on local situations. Up to now, standard for 70 to 80 products has been formed. Ganjie is now discussing with governments on turning business standards to industrial ones so as to sell products in larger areas. It also works with local government to provide e-commerce trainings on provincial level or nationwide.

Yunnan Puer Zhuofan E-commerce Co., Ltd. boasts 14-year practical operation and management experiences in e-commerce field. Authorized by government to exclusively operate the “Jingdong Puer Shop” in November, 2015, it aims to promote quality Puer across the country. Approved by the Department of Commerce of Yunnan Province, it also serves as the operative institution for e-commerce public service center in Puer city. This center is positioned to serve traditional companies in their transformation, giving market information and requirements back to companies in order to enable them to produce and sell Internet-matching products. Making use of “Puer Premium Shopping” platform, it regularizes product producing and processing according to platform standard so as to help companies promote online sales. For instance, “Da You wei” company boasts quality mango juice in both icon and paper package. After statistical analysis proves better sales on paper package, it is

recommended that the company should prioritize online sales for paper package juice. Eventually the sales performance is very satisfying.

Shuangchuang Industrial Park in Xichuangbanna, Yunnan province has so far helped incubating 53 small and micro businesses with half being agricultural companies. It mainly works with farmer cooperatives, offering e-commerce services like marketing proposals, product research and branding. After branding efforts, the hand-made soaps produced by local cooperative and sold at RMB 20-30 now enjoys prices of RMB 50-80 with higher value added.

1.10 Offer the Chance to Trace Agricultural Products

The application of Internet technology has promoted the development of agricultural product tracing system. In Zhejiang province, over 19 thousand sizable agricultural producers have put their information in the data management base on the provincial tracing platform, with more than 890 thousand pieces of quick checking data stored on the platform and over 4700 producers achieving responsibility tracing or producing process tracing. In Pinghu, Zhejiang province, a vegetable processing factory director says that they sticks QR code on vegetables. Customers can know the whole producing and processing procedures by scanning the code, which enables them to trust the product quality and establishes the brand reputation.

In Shouguang, Shandong province, farmers show to us the quality tracing application for agricultural products. It is developed by Shouguang Municipal Bureau of Agriculture and used by farmers for free. By scanning the QR code picture stuck on the greenhouse wall with mobile, customers can know specific information about the color pepper planted by farmers. Information about the planting base, the sampling and checking time as well as the inspection result are shown in the “Testing” part of the mobile app. The pesticide concentration of vegetables is tested before picking. If the testing result do not meet standard, vegetables should go through pesticide degradation and another testing process. Only with positive testing result can they be picked. Information like sales amount, purchaser, and deal record keeper is demonstrated in the “Sales Information” part. Customers can also know the yield and record keeper under the “Picking” part while the “Planting” part gives access to the operator of cutting, splitting and watering. A series of specific notes can be obtained through QR code scanning.

Chenhui, the focal point for the rural shopping center in Guangshui city, Hubei province, says that she has helped villagers sell over 5800 boxes of peach on the rural shopping platform in 2016. This year it is planned to sell 10 thousand boxes. When peaches are ripe, she buys them from farmer at a higher price than that offered by vendors. For example, if vendors offer a price of about RMB 1 per 500 grams, she would buy peaches at RMB 2-3. She uses “box numbering tracing method” to make sure the good quality of peaches that she buys. When packaging peaches into boxes, she would number boxes based on different planting areas, like 001 and 002 with each number representing one area. Such simple numbers help farmers recognize the box in which peaches belong to them. If there is anything wrong with the product, she could find out the original planting area according to the box number. For farmers who violate regulations, Chenhui would stop helping farmer sell their product. Such a tracing system makes farmers pay high attention to boxes. They never use boxes that do not belong to their own areas. They also attach great importance to the product quality.

2 Constraints Faced by Farmers and New Agricultural Operators

Internet has brought new opportunities to farmers and new agricultural operators, but they still face the following restrictions before making full use of Internet to carry out rural economic transformation and upgrading.

2.1 Backward Network Infrastructure

In some areas, Internet usage has been troubled by small network coverage, narrow network bandwidth, low access rate, high cost of telecommunication network and other problems, which are more prominent in mountainous areas and areas with low population concentration and economic development level. For example, Chengxian County in the mountainous area in Gansu Province has achieved the broadband coverage in 106 administrative villages at the coverage rate of only 43.3%, but it faces the problems of low operating speed and quality and high expenses, which restricts the spread of agricultural information and hinders the e-commerce development. In Pu'er in Yunnan Province, because the mountainous areas account for 90% of the total area, it requires a huge network investment. It takes RMB 1 million to build a base station, but there may be only a dozen people in a village and not everyone is using the network. It is impossible for the low consumption to support the construction of base stations, broadband pavement and maintenance fees, so operators are not motivated to invest in the construction of network infrastructure. The breeding base of Chenxiao Commercial Trading Company in Jinghong City intended to install monitoring equipment to carry out online adoption business in 2008, but the plan was not able to be achieved due to unwillingness of the telecommunication company in investing in construction of network infrastructure, which could not produce return in direct proportion to investment due to the remote geographic location and rugged road of the base.

2.2 Many Local Specialty Products Lack QS Food Production License and Industry Quality Standards

The e-commerce development of agricultural products has opened the way for the sale of local specialty food and thus created the conditions for farmers to increase their income. However, the local specialty food requires QS food production license to be sold on large network platforms. To obtain this license, it requires processing equipment at a high standard, complex examination procedures, the fees of RMB tens of thousands or so for paying professional agencies for issuing reports and handling certificates, as well as annual inspection. Most of the products produced by local farmers in the traditional methods are specialty food with local historical and cultural characteristics, which can not meet the requirement of QS food production license. Moreover, there is also no relevant enterprise standard or industry standard. As a result, the online sale of many kinds of local specialty food will certainly be restricted. The platforms of online supply and online sale will also prefer to work with processing enterprises with QS food production license, rather than with farmers' cooperatives or household farms or large households which have not obtained QS license. According to the person in charge of the quality and technical supervision bureau of Yicheng City in Hubei Province, Internet technology is conducive to promoting standardized agricultural production and the government rewards operators which adopt new technology for production. However, it is required that these operators have to reach a certain scale, which can not be met by many farmers and new operators. As a result, they are not able to get government subsidies to adopt new technology for standardized production.

2.3 Shortage of Development Funds

While using Internet for sale, the producers are forced by the expansion of the online market to expand production, enhance product quality, introduce advanced production technology and adopt the online marketing strategy, which all require the injection of funds. However, it is found in the investigation process that shortage of funds has become the bottleneck for the majority of new operators to further use Internet for development.

According to the general manager of Shengyuantang Industry in Zhenyuan County, Pu'er City, Yunnan Province, although the factory has the assets appraisal value of RMB 200 million, its machine can not be mortgaged because of banks' risk control and only its office building can be used as loan collateral. As a result, the company has only obtained the loans of RMB 10 million from the credit cooperative and bank. In order to carry out e-commerce, the company has invested RMB 17 million for employee salary, e-commerce training, platform construction and other work, but it has only reached the annual sales of RMB 4 million. The company's e-commerce business is currently at a loss. According to the person in charge of e-commerce business of Chuda Duck Industry in Yicheng City, Hubei Province, although the company's online sale continues to increase, its existing production workshops can neither meet the production demand, nor expand the factory for production expansion due to shortage of funds. There are more and more duck-breeding farmers, but they can not receive storage and cold chain logistics services because there is no sufficient fund for construction. Consumers' demand for preserved egg quality is getting higher and higher, so the duck factory intends to build automation equipment for large-scale and standardized production of preserved eggs. However, its goal can not be achieved due to lack of funds. Legend Gardening Company, which is an e-commerce operator selling succulent plants, ranks top one among 200,000 sellers in the green vegetation category on Taobao.com and has the credit rating of five golden crowns. Its credit rating is the highest in all industries among e-commerce operators in Hubei Province. Its sales volume has increased from RMB 9 million in 2014 to RMB 45 million in 2015 and then to more than RMB 77 million in 2016. With the surge in sales volume, it needs more production bases and funds, but it can only rely on the existing base and outsourcing to maintain supply rather than expand the planting area due to lack of funds.

2.4 Poor Practicability of IoT Devices

It is found after investigation that the current IoT application is still in the demonstration and promotion stage and it has not reached the stage of large-scale application yet. Some IoT devices are of high price and their operating cost is higher than the labor cost. The technological research of IoT devices is not closely linked to agricultural production technology, leading to insufficient function of IoT devices in precision agricultural production and affecting the farmers' and new agricultural operators' usage of and trust in IoT devices. IoT R & D design faces the realistic difficulty of modeling of different varieties and even the same variety in different regions. According to introduction of the person in charge of Jiaying Baimei Ecological Agricultural Science and Technology Park in Pinghu City, Zhejiang Province, temperature, humidity, light, moisture and other detection sensors can only adapt to agricultural monitoring of a single variety rather than multiple varieties, making it impossible for the same greenhouse to adjust the varieties planted according to the market demand. As reflected by Hubei Provincial Department of Agriculture, IoT is more applied in the animal husbandry industry. As for the promotion of IoT application in field crop plantation, many IoT devices are not suitable because they are developed under the condition of closed space.

It is also found after investigation that agricultural IoT facilities and equipment face the problems of high maintenance cost, poor quality and stability. Domestic IoT devices generally have the problem of poor quality and require repeated input after usage, severely affecting the users' enthusiasm. For example, the intelligent vegetable greenhouse of Jiaying Baimei Ecological Agricultural Science and Technology Park in Pinghu City, Zhejiang Province, experienced the awkward situation of poor signal, power failure and automatic roller blind failure, but it could not operate the devices manually. A soil data monitoring sensor inserted into the land is sold at RMB 3,000 in the market and tends to fail easily. The poor quality of the devices costs the intelligent greenhouse of the park the maintenance fee of RMB 5,000 per mu per year. The poor quality and stability of the IoT devices have reduced the users' trust in these devices. According to a person in charge of a grape industrial park of Shouguang in Shandong, the park has installed monitoring and temperature control devices because some customers want to see the actual production process. In actual application, they always have to

manually control the rolling blinds after manual observation of temperature because they do not trust the automatic rolling blind devices.

2.5 Lack of Professional E-commerce Talents

It is found after investigation that the lack of Internet talents is the common problem faced by all business operators related to Internet. For example, for agricultural departments to promote rural economy transformation and upgrading through Internet, they need cadres who understand both agriculture and Internet. According to the reflection of Hubei Provincial Department of Agriculture in the investigation, the current work of the agricultural departments is still about teaching farmers to farm well, but it is still difficult for them to teach farmers to use Internet to transform and adapt to the changes of the information age. There are very few cadres in the agricultural departments who understand both agriculture and Internet.

Farmers' cooperatives, agricultural enterprises and e-commerce service enterprises have generally reflected the lack of professional e-commerce personnel. In the e-commerce process, PS, Photoshop and other network techniques are required for shop decoration, art designing, product photography and promotion and e-commerce marketing skills are also required, which are difficult for less educated shop owners. In Paosha Town, Chengxian County, Gansu Province, 10 in 15 villages have opened rural Taobao and two thirds of the shop owners are women. Although they have participated in e-commerce training of basic knowledge, they still need to repeatedly read notes and be taught by technical staff personally before they are able to master the basic knowledge of opening the shops. They are basically incapable of a higher level of marketing, promotion and art designing.

Relevant enterprises face the difficulties in recruiting and retaining personnel. Chuda Duck Industry in Yicheng City, Hubei Province started e-commerce business in 2016 with after-sales customer service personnel, pre-sales customer service personnel and art designing personnel in its e-commerce team. However, most of these employees only have junior college degree and only master the most basic knowledge rather than high-end e-commerce operation knowledge. As the person in charge of the e-commerce business of the company, Ren Le has to do the work in person. Now, he learns how to open the direct channel and diamond exhibition with one of his high school classmates in Wantang School of Taobao University and studies independently till 11:00 p.m. everyday. In order to alleviate the shortage of e-commerce personnel, Shengyuantang Industry in Zhenyuan County, Pu'er City, Yunnan Province, has registered a company named "Yunnan Rural Culture Company" in the provincial capital Kunming to recruit personnel. After these employees agree with the company's culture, they will be assigned to work in the headquarters in Zhenyuan County.

2.6 Difficulty of the Use of E-commerce Platforms

While carrying out e-commerce, farmers and new agricultural operators usually use Taobao, Tmall, Jingdong, Suning and other third-party platforms to open their shops and operate the shops in accordance with the rules of the platforms. However, it is found in the investigation that many farmers and new agricultural operators reflect that these platform set up strict conditions for access and offer low profit margins. They have to pay the registration security deposit of more than RMB 0.1 million per year for settlement in Jingdong Mall, RMB 0.1 million per year for settlement in Tmall, RMB 5,000 per year for Taobao and RMB 1,688 per year for Alibaba. They also have to pay fees for marketing activities such as opening the direct channel and opening the diamond exhibition on Taobao. At last, their profit margins are greatly reduced.

However, many e-commerce operators still choose the big platforms, especially Taobao, for their large customer flow. Online shops opened on Taobao in Gansu Province account for 90% of the total number in the entire province, and the rest 10% are on the platforms including Jingdong, Suning, self-

built websites, etc. It is learned from the investigation that most physical shop owners have opened online shops on Taobao. According to the person in charge of e-commerce business of Chuda Duck Industry in Hubei Province, in spite of small profit margin, large platforms bring a large number of customers and high sales volume; and the platforms tend to be more fair in dealing with the disputes between customers and merchants due to the large number of customers.

Some people choose the platforms with low access threshold and less strict regulation. For example, they open We-chat shops, set up We-chat public accounts or post messages on microblog, which do not require any fee. They can sell products by making advertisement in their moments. In Pinghu City and Suichang County in Zhejiang Province, many farmers sell products by opening We-chat shops or using We-chat public accounts. By relying on the geographical advantage of being close to Jiangsu, Zhejiang and Shanghai, they target at the high-quality agricultural market to advertise their agricultural products by posting videos or pictures in their moments, as well as attract tourists from Jiangsu, Zhejiang and Shanghai to pick up the products in the plantation bases.

E-commerce operating cost is high. A lot of publicity has to be done particularly when new shops are just opened to enhance publicity effect and attract more customers. It costs money to buy advertising space, bringing in customer flow and carrying out activities. Moreover, the profit margin of agricultural products is itself small and the cost is high, so the profit of shops is reduced. According to the responsible person from Zhejiang Pinghu Green Island Food Co., Ltd., their online sales volume grows at the annual rate of 30% to 50%, but the profit of online sale is only 10% due to the high cost. They also need to pay RMB 20,000 to 30,000 per year to participate in e-commerce training in Alibaba in Hangzhou to master the latest rules of e-commerce operation and particularly the way of carrying out new sales activities. According to the responsible person from Gansu Longyi E-commerce Co. Ltd., it takes RMB 20,000 per month for leasing an advertising section on the home page of Taobao and RMB 0.2 yuan for each click on a product regardless of whether the consumers buy it or not if the shop uses the service of "neighboring good products" launched by Taobao to promote products. Shengyuantang Industry in Zhenyuan County, Pu'er City, Yunnan Province, once bought flow on Baidu to implement network promotion, which costed more than RMB 0.8 million in one week. Although it achieved the customers flow, its sales volume was not significantly enhanced because most of the customers just took a look and did not actually buy. Chenxiao Commercial Trading in Jinghong City paid for the fee of bringing customer flow in 2016 which was about two times of that of 2015. It cost RMB 0.3 to 0.5 for one customer in the past, but now RMB 1. However, the customers just make inquiries after visiting the shop and it is very difficult for the actual sales volume generated to cover the marketing cost. Chuda Duck Industry achieved the sale of RMB 20 million in 2016, but its profit margin was only 10%. It spent about RMB 0.3 million on advertising when it started to operate e-commerce.

The access threshold of the platforms is high. Agricultural products are defined as processed products as long as they are roughly packaged when they are sold on Taobao. Taobao requires that all processed agricultural products entering the platform must have QS certification. However, it is found in the investigation that many operators, who want to sell agricultural products on Taobao, reflect that QS certification has complicated procedures and strict application conditions and is quite time-consuming. It hinders online sale of some specialty agricultural products or agricultural products in small-scale production which can not meet the qualifications of QS.

Zhejiang Pinghu Jianfeng Farm wants to apply for QS logo. According to the requirement, it must have a rice processing workshop of more than 500 square meters and testing equipment and other supporting facilities, but its current rice process factory only occupies 120 square meters. It is difficult to expand the factory because it does not have more land. As a result, it cannot apply for QS logo to carry out online sale. According to the person in charge of the e-commerce service station in Enle Town, Zhenyuan County, Yunnan Province, agricultural products become processed products after simple packaging. The station once planned to implement QS certification, but it consumed too much time and costs too much. For example, it cost RMB 40,000 for organic certification of agricultural

products, RMB 20,000 per year for renewing the organic certificate and RMB 80,000 for green certifications; the fee of testing each sample was RMB 2,000 and each batch needed to have the test report, causing huge cost if there were too many batches of processed products. As a result, the shop gave up certification because its production of agricultural products was small and the sales profit could not cover the cost of certification. Haohai Media Company in Zhenyuan County commissioned another company to carry out QS certification. RMB 20,000 is required for one application for QS logo of one agricultural product.

There is difficulty of online sale of agricultural products. In terms of online sale of agricultural products, online shop operation requires high levels of technique, management and capital. It is more suitable for professional teams rather than ordinary farmers and general farmer cooperatives. Although local governments have adopted impetus measures and farmer cooperatives have made active attempts due to their high expectations for e-commerce sales of local specialty agricultural products, they have not achieved ideal effect for most of the time. Sale through online shops requires QS certificates of products and deposit paid to e-commerce platforms. After opening the online shops, there may be dozens of or even hundreds of online shops selling similar products, so it becomes the main problem faced by shop owners to attract customer flow. Online shop operation requires professional online marketing techniques and professional personnel, as well as a lot of market fee paid to the online platforms. Some local specialty agricultural products win by quality and are of high price; but customers on large platforms such as Taobao are very sensitive to the price, leading to price war among the online shops and making it difficult for high-quality agricultural products to be sold at high prices. Although online sale of agricultural products can save the cost of intermediaries, it increases the costs of packaging, logistics and marketing. Therefore, even the competitive leading enterprises cannot easily make money by opening online shops and it is even more difficult for ordinary farmers and professional cooperatives. Therefore, most farmers and farmer cooperatives are still in the production link of the agricultural industry chain. Internet only creates an extra sales channel for them.

For example, a vegetable cooperatives in Gaoping Village, Suichang County, planted 100 mu of vegetables and once built its own platform for online sale. But its online sale and customer evaluation were affected by immature online vegetable sale, the short freshness lifetime and other factors. The supply for online sale was small everyday and it required quality packaging, which also cost high labor fee. It once spent RMB 60,000 every year to hire others to make advertising in Shanghai, but did not achieve ideal effect. Therefore, the cooperatives has now given up online sale and turned to only engage in offline sale. It dispatches one truck of vegetables to a vegetable wholesale market in Hangzhou every day, which takes the ride of four hours. The profit is higher in this way.

There is the phenomenon of e-commerce operators making false orders. Because Taobao ranks products according to the sellers' credit, sales, price and popularity in the product sales process and consumers will choose products based on the ranking, products may have better sales volume if they rank in the front on the web page. The ranking of an online shop relies on its sales volume and click rate, so the phenomenon of making false orders⁴ comes into being. This phenomenon severely affects the shop owners who do not make false orders, but face bleak sales volume and operational difficulty because they do not have enough visitor volume. False orders generate false sales volume, misleading consumers and disturbing normal economic order. Taiyuanfeng Cooperatives in Yiyuan County, Shandong Province spent RMB 100,000 to promote products on Taobao in 2016 and sold 50,000 kilograms, but Taobao claimed that the cooperatives enhanced its ranking by false transactions and finally automatically closed customer consultation, which resulted in heavy losses of the cooperatives.

⁴ The behavior of making false orders on Taobao means that sellers simulate true shopping to enhance the ranking of the shops and products, so as to enhance their display rate and enable more buyers to find them on the homepage of Taobao to facilitate purchase. However, it is a means of cheating consumers.

The cooperatives especially went to Alibaba headquarters in Hangzhou to defend itself on this issue, but did not get this matter resolved.

In terms of ranking based on price, some sellers mark the prices of their products below the market prices to increase visitor volume and then enhance their credit. But such low-priced products actually do not exist and they are just the marketing means for shop owners to enhance visitor volume and credit, which virtually suppresses the sale of similar products.

2.7 Online Sale Is Not Suitable for Bulk Agricultural Products

It is found in the investigation that bulk agricultural products are basically traded offline and they are just promoted and advertised and bring in customer flow online. It is mainly because that they have low profit, while the profit of online sale can not cover the cost of online operations (including the advertising fee, shop deposit, etc.). The person in charge of Linhai Vegetable Cooperatives in Suichang County, Zhejiang Province, has said helplessly that many people now know agricultural products sold on Internet platforms are of high prices and the sales volume can be enhanced; but false orders need to be created for shops on Taobao, otherwise, there will be no customer flow. With low profit, the sales of agricultural products can not cover the cost of making false orders. The responsible person once opened a shop on Taobao, but gave it up after only achieving one order or two orders. Compared with online sale, it is more cost-effective to directly transport the bulk agricultural products to large wholesales market in Hangzhou, Ningbo, Shanghai, Hongqiao and other areas for sale.

Secondly, the cold chain logistics is not perfect. It can not guarantee that the agricultural products always remain fresh in the transportation process and the products may easily have the quality problem, leading to extremely high compensation rate of online transaction. As a result, the sellers do not dare to sell agricultural products online, but normally choose online advertising and offline negotiation and transaction. According to a merchant from Yicheng City, Hubei Province, who settles in an e-commerce incubation center, he uses Hunan Huinong Network to advertise the agricultural products to attract customers and then conclude offline negotiation and transaction. Due to the imperfect cold chain logistics, improper storage and climate change in the transportation process may easily cause deterioration of agricultural products, so that the customers will feel deceived when they receive the deteriorated products and the company will face high compensation. Therefore, it is better to have the customers check the products before loading and delivery.

2.8 Insufficient Motivation for the Use of the Traceability System for Agricultural Products

Consumers do not have large demand for agricultural product traceability and there is no specific legal provision requiring that the traceability system has to be used for agricultural products, so farmers and new agricultural operators can not achieve high quality and good price even if they use the system, which affects the enthusiasm and confidence of farmers and new operators in using the traceability system. At present, the Ministry of has only made the mandatory requirement that the traceability system must be established for veterinary drugs. According to the responsible person from the Agricultural Department in the investigation in Zhejiang Province, the government requires that agricultural products sold in the market must be able to be traced back to the operators, but it is not required for market operators. As a result, it is very difficult to require that production or wholesales enterprises must have traceable QR code. In addition, there is no unified standard for the traceability system, causing difficulty of promotion and usage. As said by the responsible person from the medicinal materials logistics center in Longxi County, Gansu Province, the traceability platform being used now is neither complete nor unified and the requirements for information input are different. There is no national unified traceability platform, which is not conducive to standardized information query.

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