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Research on the Different Choices of Chinese Herbal Medicine Planters on Agricultural Production Coordination Forms: Analysis of the Case of Bozhou City

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ABSTRACT

The study analyzed the choices of Chinese herbal medicine planters on agricultural production coordination forms based on the case of Bozhou city from the perspectives of farmers. Next, an empirically survey of the different choices of planters on the forms or types of vertical coordination was carried out and the analyzed results showed that loose vertical coordination types were the main choices of planters. Although there was no obvious difference between diverse types of the vertical coordination in obtaining of planting elements and farming scales, the planting benefit of close vertical coordination was better than that of loose vertical coordination. Moreover, more than half of the surveyed herbal medicine planters showed positive intentions on the close types of vertical coordination. In particular, the planters were more concerning on the market transactions than the contract transaction aspects.

Key words: Chinese herbal medicine, planter, coordination, transaction, vertical integration

INTRODUCTION

China is one of the largest countries of the production and consumption and research of herbal medicines in the world. In particular, Chinese herbal medicines are the traditional inherited dominant industry in China, with independent intellectual property rights and international competitive potentials. As unique valuable human resources in the world, Chinese herbal medicine industry and medicinal materials are increasingly brought to the attention of the national sectors, communities and government departments with the return trend of human health cares to nature and the need of the changed status of severe infectious diseases in China. Furthermore, as one of the national famous centers and the hometown of Chinese ancient miracle doctor "Hua Tuo", Bozhou city is well known as a large planting and manufacturing base and a great circulating and distributing center of Chinese traditional herbal medicines in Anhui

province, China. At present, Bozhou city is the largest market of Chinese herbal medicines with more than 170 families of traditional Chinese medicine resources and over 4000 medicinal plant varieties. In addition, there is a huge perennial medicinal planting land of about 40,000 ha which accounts for one over ten of the national medicinal planting area. Therefore, with this large market and enormous resources of Chinese herbal medicines, the medicinal enterprises in Bozhou city become powerful economic entities. The large market, huge resources and strong enterprises of Chinese herbal medicines have brought a great economic prosperity to Bozhou city and its surrounding regions. Among those herbal medicinal resources, white herbaceous peony is famous as one of the national four traditional generics or medicines in China (Fig. 1 and 2). In particular, the good root of white herbaceous peony (*Radix paeoniae alba*, Fig. 1) appears in white and cylinder with the powder weight, good quality and large output, but its white lines should be unapparent. Furthermore,



Fig. 1: Root of white herbaceous peony



Fig. 2: Flower of white herbaceous peony

the finished product of white herbaceous peony is deemed as the famous authentic type of Chinese herbal medicines, which is exported to the Southeast Asian countries.

On the other hand, the plant sources of Chinese herbal medicines can be artificially divided into the wild varieties and the domesticated varieties, but the major varieties of Chinese herbal medicine plants are domesticated and commonly used in Chinese traditional herbal medicines. Thus, the Chinese herbal medicine plants are mainly planted and bred by private farms and there is little market space of wild varieties of Chinese herbal medicine plants.

Although, some large companies (or enterprises) have their own herbal medicinal planting bases, but their production of Chinese medicinal materials can hardly meet the demand of Chinese herbal medicine market. With the rapid development of Chinese patent medicines and related herbal medicinal products and the raised export scale of Chinese herbal medicines, the increasing market demands for Chinese traditional herbal medicines inevitably choose and use the medicinal materials planted and/or raised mainly by planters. However, there has been a lack of close cooperation and

processing organization in the agricultural industrial chain links of Chinese herbal medicine plants, most of the production of Chinese herbal medicines are still giving priority to the loose market cooperation of small farms and planters with companies and/or enterprises in the agricultural industrial chain links. Currently, the agricultural industrial organization mode is actually one of the organized system arrangements among enterprises and planters and other members in the industrial cooperation. In fact, one of the perceived benefits of vertical integration is able to respond more quickly and correctly to changing the production's types into the consumer's demands, especially changing tastes and preferences to capitalize on profit opportunities. Therefore, it is inevitably affected by the environmental factors and their characteristics in the market. In fact, the organization mode or arrangement of economic cooperation and environment includes at least three aspects of social content, i.e., the institutional environment, the resources environment and the market environment.

At present, along with the development of modern economy, there are diverse forms of the cooperation of different groups organized in the agricultural industrial chains of Chinese herbal medicines. Among these forms, the vertical coordination is most concerned which includes the forms of market transaction, contract transaction, vertical integration transaction and other these contacts of collaboration. In this field, the early researchers were interested in the vertical cooperation. For instance, Lieberman (1991) argued that the changes of demand were the causes of vertical coordination in addition to the transaction costs. Hobbs (1997) explored the transaction cost and its influence on the vertical coordination in beef industry, but reported a limited influence. Ward (1997) found the vertical cooperation forms were much related to the characteristics of the product, such as beef, pork and poultry. Later, Martinez (1999, 2002a, b) systematically reviewed and compared the roles of agricultural vertical coordination in the poultry, egg and pork industries of USA. He suggested that agricultural vertical coordination should be regarded as a kind of organizational innovation, including various factors of the production coordination and marketing links, such as market transactions, contracts, cooperatives and the integration of various forms. Doloreux and Parto (2005) also reviewed the discourse and unresolved issues of technology in regional social innovation system. Guo (2005) analyzed the cooperation behaviors of planters and their influence factors to participate in order arrangement from five aspects, i.e., the household characteristics and business characteristics of the planters, the types of agricultural products, the market characteristics of agricultural products and environment conditions of households. The results showed that the economic characteristics of the products and the household characteristics of planters have a certain influence as well as the governmental policy and support on the vertical cooperation. Wang *et al.* (2006) found positive influence of the

market characteristics and the household environment conditions on the vertical cooperation forms of part of the beef cattle farmers in two Chinese provinces, Jilin and Hebei. Nor *et al.* (2006) made an empirical study on vertical integration, foreign multinationals and the stigler's hypotheses using Malaysian data. Zhang (2008) analyzed the impact of vertical coordination on the farmers' behavior in applying rice fertilizer based on the survey data of 189 rural households in Jiangxi province, China. Ying and Wang (2009) also made an empirical analysis of farmers taking Chinese pig industry in Jiangsu province as an example. They found the transaction cost was the main influence factor for farmers' cooperation and choices. Meanwhile, Meade and O'Connor (2009) compared the long-term contracts and the vertical integration in decentralized electricity markets. Pieri and Zaninotto (2013) analyzed the vertical integration and its efficiency in application taking the Italian machine tool industry as an example. Sun *et al.* (2010) and Sun and Liu (2011) made empirical researches on the farmers' choices of vertical cooperation based on the survey data on the poultry industry in Jiangsu province, China. They analyzed the farmers' willing for choices and its influencing factors of vertical coordination and found that most of the farmers were willing to choose the contract transactions in vertical coordination. Cai and Han (2011) explored the impact of transaction cost affecting the farmers' choices of vertical cooperation based on the survey data of apple growers in Shandong province, China. Their study revealed that there were natural and market risks in the poultry breeding industry, mainly including the following risk aspects of poultry epidemics, i.e., market price fluctuations and the rising production costs. Moreover, they found the risk perceptions and decisions of farmers in close forms of vertical coordination were most effective under different natural and market risks. Terreros and Gorriz (2011) inspected and compared the effect of organizational form and vertical integration on efficiency with an empirical analysis between cooperatives and investor owned firms.

Yao and Qi (2011) analyzed and found the impact of transaction costs was positively effective on Chinese farmer's choices and willing in the vertical cooperation modes of the fresh tea trading and transactions based on the analysis of survey data of 29 counties and 1394 farmer households in nine Chinese provinces and municipalities. Zhang *et al.* (2014a) explored the production performance and vertical cooperative mode of the rural households based on the analyses of transaction costs and risks. Zhang *et al.* (2014b) analyzed the differentiated behaviors of the decision-making and cognition of farmers under different vertical cooperation ways based on a questionnaire survey data of 375 poultry farmers in Shandong province. They found that reducing risks and costs in the transactions was the main reason for the farmers to choose a vertical cooperative mode or form. In addition to the access of industrial information sources, the production characteristics, household characteristics and individual

characteristics and social capital of chicken farmers would have important influences on the choices of vertical cooperative forms. Later, Wan (2015) inspected the impact of rural vertical coordination mode on farmers' behaviors in applying rice fertilizer, while Liu *et al.* (2015) made a perspective on vertical cooperation in oil-tea industry in Guangdong province, China. In summary, all those researchers studied the forms and related influence factors of the household vertical coordination from the points of view of the transaction cost, the specificity of asset and production and the producer's characteristics, etc. The review of previous studies and researches provided us much beneficial enlightenment and ideas. However, there was little research presented in the vertical coordination of herbal medicines and/or medicinal materials in recent years. This study was designed to investigate the production mode of Chinese herbal medicines from the viewpoints of planters and analyze the current forms of vertical coordination of planters as well as the choices and related influencing factors of the vertical coordination forms of planters from the market sales channels of Chinese herbal medicines in Bozhou city.

MATERIALS AND METHODS

Data sources and collection: At present, there is a large region covering a planted area of 52300 ha in total and many industrial clusters of Chinese traditional herbal medicines are booming in Bozhou city. It is estimated that there are marketing transactions of Chinese medicinal plants and related materials with a value of more than 20 billion Yuan in the medicinal industrial clusters of Bozhou city. The investigation was executed in the following intensive precincts of Bozhou city as the representative sampling sites, such as Hua Tuo town, Wei Gang town, Wu Ma town, Qiao Dong town and other townships in the Bozhou district. The data were collected during the period of 2012-2014 with questionnaires and interviews in those townships of Bozhou district. There were totally 200 questionnaires distributed, but only 178 questionnaires were filled out and fed back by the sampled planters. The recovery ratio of questionnaires was computed as 89.0% in this study. In addition, sampling interviews were carried out with all the sampled planters in these same towns to investigate the current mode and form of Chinese herbal medicine planters in the process of production, sales and their attitudes towards closer or loose vertical coordination.

Defined industrial organization modes of Chinese herbal medicines: In the present study, the industrial organization modes of Chinese herbal medicines were divided into three basic types from the perspective of production and management. The first was the loose mode in which enterprises usually linked the upstream industrial clusters through the market transaction. The second was a half close

format in which enterprise acquired the raw materials of Chinese herbal medicines from the circulation intermediaries and other ways by the contract transaction dealt with planters. The third is the close type in which enterprise mainly used the planting base and the vast majority of the medicinal enterprise was difficult to achieve the full integration of collaboration since its land belongs to the planters.

RESULTS AND DISCUSSION

Forms of vertical cooperation chosen by the sampled planters: According to the executed survey and statistics (Table 1), there were mainly four types of sales channels or the vertical cooperation forms of Chinese herbal medicine planters in Bozhou city, i.e., dealing with the traditional Chinese medicine trade market or bazaar, transacting with the relatively fixed circulation intermediary companies and/or individuals for the purchase of medicines, cooperation with the cooperatives or associations and other organizations of Chinese herbal medicines and direct transaction with the processing enterprises of Chinese herbal medicines. Therefore, the vertical cooperation forms of planters were mainly divided into three classes, i.e., market transaction, contract transaction and vertical integration according to the characters of medicinal transactions and the close degrees between the cooperative sides (Table 1).

Market transaction: There were many herbal medicine planters adopting the way of market transactions that accounted for a big proportion of 83%. This form of transaction mainly did sales through the professional market and the farmer’s markets to sell traditional Chinese herbal medicines and the related medicinal materials without any agreement between the buyer and the seller before trading. But there was no agreed quantity and quality and the price of Chinese traditional herbal medicines was uncertainty which was subject to supply and demand in the market of Bozhou city. The herbal medicine planters would sell their production to the highest bidder and the price was varied.

Contract transaction: There were only 15.7% of herbal medicine planters selling their production by way of contract transaction with the relatively fixed circulation intermediaries or professional cooperatives and organizations with the oral or written agreement on prices. In this form of vertical cooperation, intermediaries and professional cooperation organizations mainly provided some market information and technical guidance to make the promotions of rapid sales.

Vertical integration transaction: There were only 2.3% of herbal medicine planters taking the way of vertical integration transaction by making household contract and underwriting contract with the enterprises and/or organizations. This way was mainly adopted in the planting bases of the processing and decision-making enterprises or companies of Chinese herbal medicines.

Access to the essential factors of production in vertical coordination: To a certain extent, access to the essential factors of production in vertical coordination reflects the socialization of the regional social production. In fact, the main productive factors of the herbal medicinal planting, such as land and labor were almost self-supplied in Bozhou city. In the study, it was found that there were 115 planters (64.6% of the sampled people) used self-bred herbs seedlings, 57 planters (32.0%) purchased herbs seedlings from the seed market and the other 6 planters (3.4%) obtained seedlings through other ways (given gifts or provided by employer companies). Furthermore, fertilizers and pesticides were directly purchased from the common agricultural capital market as there were no specific fertilizer and pesticide for herbal medicinal plants. As for the financial funds required for planting, it was recognized that the capital almost came from the planter’s accumulation (accounted for 95.6%), while merely ten people brought the funds from bank loans. In the technology acquisition of herbal medicine planting, there were 116 planters (65.2%) acknowledged their access by reading newspapers, watching television and browsing network, while 54 people (30.3%) obtained planting technology from neighborhood

Table 1: Statistics of the sampled planters of Chinese herbal medicines

Transaction classification	Transaction characteristics	Unit number of planters surveyed	Percentage of planters surveyed (%)
Market transaction	There is generally no agreement before the coordination of transaction in both sides and the buyer can make a one-time buyout without involvement in the production process of Chinese herbal medicine	146	82.0
Contract transaction	Coordination is relatively stable between sellers and buyers with multiple transactions. The company owns the planting and producing bases of Chinese herbal medicine run by planter and their transactions are linked and executed according to contracts with reference to the market prices	28	15.7
Vertical integration transaction	Land is leased by planters to the company to gain a profit from organizing the production of Chinese herbal medicine, while the planter makes a profit from providing labor and land in planting the herbal medicine plants	4	2.3

Table 2: Statistics of the forms of vertical coordination of different transactions and the planting scales in Chinese herbal medicine planting

	Agricultural acreage					
	1000-2000 (ha)		2000-4000 ha		Over 4000 (ha)	
	Unit number of planters	Percentage of planters	Unit number of planters	Percentage of planters	Unit number of planters	Percentage of planters
Production collaborations						
Market transaction	36	20.2	75	42.1	32	18.0
Contract transaction	4	2.3	16	9.0	15	8.4
Total	40	22.5	91	51.1	47	26.4

communications and personal summarized experiences and only 8 planters (4.5%) got technical training by the government and/or cooperation organizations.

However, the statistics showed that there was no obvious difference in different forms of vertical coordination of herbal medicine planters in terms of the essential factors of production (Table 1). The possible reasons accounting for this phenomenon were inferred that the growth of production factor's market was imperfect and the traditional production mode of small-scale farmers has not acquired the fully socialized elements of production with the predominant loose vertical cooperation of the medicinal herb cultivation and the medicinal industry.

Different forms and planting scales of vertical coordination: Because the production of Chinese herbal medicines was planted and harvested in disparate years, the planting areas were investigated in the survey. In the statistics, the effective sample was composed of 178 planters with an average planting area of 3000 ha (Table 2).

Benefit analysis of vertical coordination in Chinese medicinal herb planting: In view of the periodic planting and harvesting and marketing of herbal plants, the benefit analysis was carried with the average growing incomes of all the three years to measure the net incomes of Chinese herbal medicine planters. In the research, it was found that the sampled average net income was 185.2 Yuan ha⁻¹ which was far higher than the local average income of wheat in the same years (about 29.7 Yuan ha⁻¹). Among these diverse forms of vertical coordination in Chinese herbal medicine planting, the market transaction obtained an average net income of 180.8 Yuan ha⁻¹ and the contract transaction gained an average net income of 224.5 Yuan ha⁻¹. Therefore, the results showed that the net income of the herbal medicine planters in contract transaction was by far the greatest and all the close forms of vertical coordination were beneficial to increase the herbal plant yields and the net incomes of planters.

Planter's choices of the contract transaction types in vertical coordination: Among the 178 planters surveyed in the research, their willing to choose the types of the contract transaction in vertical coordination was divided into the following three cases. First, there were 46 households,

accounting for 25.8% of the sample, made it clear that these people were not willing to adopt contract transactions in the future. Second, there were 40 neutral planters, accounting for 22.5% of the sample, in the investigation. According to the survey data, among those neutral planters, 12 households had signed the contracts of Chinese herbal medicine planting with the processing enterprises of medicinal materials and the other households were waiting and hesitating before deciding whether to do a contract deal in the future. Third, there are 92 households declared a sure willing to adopt the contract transactions, accounting for 51.7%.

Possible causes of the planter's choices in vertical cooperation: At present, the loose forms of vertical coordination in Chinese herbal medicine planting and marketing was still dominant in Bozhou city according to the investigation of the research. With the investigated sample and surveyed data on Chinese herbal medicine planting, possible causes of the planter's choices in vertical cooperation in the market were inferred (Lieberman, 1991; Ward, 1997; Martinez, 1999; Doloreux and Parto, 2005; Nor *et al.*, 2006; Joskow, 2008; Meade and O'Connor, 2009; Pieri and Zaninotto, 2013; Terreros and Gorriz, 2011; Cai and Han, 2011; Yao and Qi, 2011; Zhang *et al.*, 2014a, b; Wan, 2015; Liu *et al.*, 2015). First, from the respects of production mode and element obtaining and planting scale, although the global planting economy is given priority to a high industrial socialization, the national medicinal herb cultivation was still in the traditional way of small farmers characterized by low socialized production of medicinal herb planting in China. Second, there were more than a third of the sampled planters never heard of the words "Market transaction" and merely 40% of the sampled planters heard of market transaction. Third, from the point view of downstream industries, many of the herbal medicine raw enterprises and professional cooperation organizations would choose a higher ratio of loose vertical coordination and a lower ratio of close vertical coordination in Bozhou city and relevant districts. Moreover, the choices of close forms of vertical coordination was influenced and limited by the local economic environment and the enterprise was characterized to choose the low transaction cost and a high benefit in the market of Chinese herbal medicine according to the rules of rational man in economics. Moreover, the choice behaviors of planters were influenced

and controlled greatly by education levels, seed sources, household financial aspects, the information acquisition, market price risks and the professional degrees of cultivation in Bozhou city.

Through review of the previous analyses, there was a dominant loose form of vertical cooperation in production and transaction of Chinese herbal medicines in China (Martinez, 1999; Doloreux and Parto, 2005; Guo, 2005; Wang *et al.*, 2006; Nor *et al.*, 2006; Joskow, 2008; Zhang, 2008; Ying and Wang, 2009; Meade and O'Connor, 2009; Pieri and Zaninotto, 2013; Sun *et al.*, 2010; Sun and Liu, 2011; Cai and Han, 2011; Yao and Qi, 2011; Terreros and Gorriaz, 2011; Zhang *et al.*, 2014a, b; Wan, 2015; Liu *et al.*, 2015). Furthermore, this predominant status promoted the rising two contradictions in the process of production and industrialization of traditional Chinese medicinal materials (Wang *et al.*, 2006; Zhang, 2008; Ying and Wang, 2009; Sun *et al.*, 2010; Sun and Liu, 2011; Cai and Han, 2011; Yao and Qi, 2011; Zhang *et al.*, 2014a, b; Wan, 2015; Liu *et al.*, 2015). The first was an obvious conflict between suppliers and demanders of Chinese herbal medicine plants in the market, i.e., the state of small-scale farming mode and long dispersible periodicity of production vs. the demand of high quantity and quality and price rigidity, the second was the discrepancy between the planter's production decision and the periodic price fluctuations (Ying and Wang, 2009; Sun *et al.*, 2010; Sun and Liu, 2011; Cai and Han, 2011; Zhang *et al.*, 2014a, b; Liu *et al.*, 2015). These contradictions might be solved by working closely between the planters and the processing enterprises and other participant in the market. However, the local market has given priority to the loose mode of vertical cooperation in Chinese herbal medicine planting in Bozhou city according to the results in the present study.

CONCLUSION

In the study, the vertical coordination between the planting and downstream industries was regarded as the most important component and linker of the producers and the enterprises in Chinese herbal medicine industry from the coordinated industrialization process. Based on the farmer's perspectives, the research analyzed the choices of Chinese herbal medicine planters on agricultural production coordination forms in Bozhou city, Anhui province, China. Subsequently, an empirically survey of the different choices of planters on vertical coordination types was carried out and the main analyzed results showed that loose vertical coordination types were the main choices of planters. There was no obvious difference between the diverse types of the vertical coordination types in obtaining of planting elements and farming scales. However, the planting benefit of close vertical coordination was better than that of loose vertical coordination and more than half of the surveyed herbal medicine planters showed positive intentions on the close forms of vertical

coordination. Specifically, these planters were more concerning on the market transactions than the contract transaction aspects according to the economic rules of rational man.

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