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Development Characteristics, Problems and Recommendations of Sweet Potato Industry in Fuyang City

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Abstract The development of sweet potato industry in Fuyang City takes on following characteristics: increase in planting area of specialized households and professional cooperatives; increase in production input and yield; constant optimization of planting varieties; diversified planting modes. Sweet potato industry has made significant contribution to Fuyang City: (1) enriching types of agricultural products and promoting healthy diet; (2) driving development of agricultural product processing industry and increasing the employment rate of rural labor; (3) increasing financial revenue and rate of export-making foreign exchange of agricultural products; (4) increasing farmers' income and promoting new socialist countryside construction. In line with comparative advantages and existing problems of sweet potato industry in Fuyang City, it presents corresponding industrial development recommendations.

Key words Sweet potato, Industrial development, Recommendations, Fuyang City

Fuyang City, situated in northwest Anhui Province, has temperate semi-humid monsoon climate. It covers an area of 9 979 km², including 585 000 hm² farmland. The prefecture-level city of Fuyang administers eight county-level divisions, including three districts (Yingzhou, Yingdong and Yingquan), one county-level city (Jieshou) and four counties (Taihe, Linquan, Fu'nan and Yingshang). Fuyang City has the largest population in Anhui Province. There are lots of surplus rural labor forces in Fuyang, making it become the important base of labor service export with the annual export quantity above 2.5 million^[1]. Since the construction of state sweet potato industrial technological system, the sweet potato industry has been steadily developing in Fuyang City. At present, the annual planting area of sweet potato in Fuyang City remains 26 000 hm², with per unit area yield of 28 t/hm² and total yield of 728 000 tons. It is predicted that sweet potato production will remain at this level in a future period of time.

1 Major development characteristics of sweet potato industry in Fuyang City

1.1 Increase in planting area of specialized households and professional cooperatives

With increase in price of sweet potato, specialized households and professional cooperatives constantly increase, and planting area is also increasing. Since professional cooperatives have many advantages in technology, fund and machine, sweet potato planting is developing towards specialized household and professional cooperative planting. By 2011, professional cooperatives in Fuyang City had increased to 965, 334 more than 2011, having an increase of 133%. Members of cooperatives reached 59 000, bringing along 290 000 farmer households, and

income of cooperative members increased more than 25% compared with non-members^[3]. Among these professional cooperatives, there are 40 sweet potato professional cooperatives that promote development of sweet potato industry in Fuyang City. Dongfan Sweet Potato Professional Cooperative in Taihe County has realized annual income above 1 million yuan from operating sprouts of sweet potato. Also in Taihe City, Baile Planting Professional Cooperative is a farmer professional cooperative integrating planting and scientific research, holding 50 members, having total area of base up to 233 hm². Its products include fresh sweet potato, starch processed sweet potato, sweet potato starch, purely hand-made sweet potato vermicelli, purely hand-made sweet potato sheet jelly. Its annual output value exceeds 5 million yuan. Baile Planting Professional Cooperative carries out various training in slack season, print teaching materials, actively contact agricultural experts to give lectures and explain the profound farming and plant protection knowledge in simple terms. Through these, it has received good reputation and awards of Santangji and Taihe Agricultural Commission many times, and was awarded as AAAA level model professional cooperative by Taihe Agricultural Commission in 2011.

1.2 Increase in production input and yield With increase in sweet potato specialized households, input of fertilizer, pesticide and machine has fund guarantee. Constant increase in input of sweet potato production brings rise in demand for cultivation technology. The production technology level has been greatly improved, the yield of sweet potato per hectare is higher than 15 tons, and this is quite common. On October 28, 2011, Yingshang Agricultural Commission, Agricultural Survey Team, and Association for Science and Technology jointly conducted 5 point sampling test for 0.33 hm² super-high-yield sweet potato experimental plot of Pingxiu Professional Cooperative in Zhangwang Village of Shibailipu Town, and got the following results: the yield of fresh sweet potato per hectare is 82 575 kg, equivalent to 23 947.5 kg

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(29%) dry pieces, 33% higher than the target specified by the experiment station^[4]. In recent years, Taihe County Dongfang Machinery Co., Ltd manufactured 1LQZ-2 sweet potato ridging shaping machine, walking four-wheel plastic film laying machine, GJZ-4 high-efficient water-saving sweet potato planting water supplier, 1ZGC-1 sweet potato intertillage weeding banking machine, and 4UG-1B sweet potato harvester. All these machines are popular with farmers and planting professional cooperatives. Luyouming Mechanical Repair Department in Shibalu Town of Yingshang County annually produced and sold more than 500 sets of sweet potato grinding machines and harvesters. Hengjin Seed Company in Taihe County is a famous agricultural scientific and technological enterprise in Anhui Province, has assets of 70 million yuan, and is able to engage in integrated production of sweet potato virus removal and sprout cultivation, with annual production more than 25 million sweet potato sprouts.

1.3 Great change in consumption structure of sweet potato

Before the reform and opening-up, sweet potato is mainly used for replacing grain. At the first 20 years of the reform and opening-up, grain problem was solved and sweet potato started to be used for feed and industrial raw materials^[2]. After entry to the new century, sweet potato started to become "food of rich people". By 2010, sweet potato has completely quitted from feed application, and turned to healthy food and food processing material. With improvement of living conditions, people's intake amount of agricultural and sideline food, especially healthy food, is increasing, and sweet potato starch is seldom used for production of fuel ethanol. The demand for fresh sweet potato gradually increases, starch, vermicelli and sheet jelly processing takes up a large portion. In Yingshang County, there are more than 400 small starch, vermicelli and sheet jelly enterprises. Generally, their daily output of vermicelli is 5–6 tons, and 8 enterprises have daily output of 20–30 tons. Annual production time is about 5 months.

1.4 Constant optimization of planting varieties The sweet potato planting in Fuyang City is mainly fresh sweet potato and starch processing. Planting variety is developing towards specialization. Special variety only takes up a small portion. Fresh potato and starch processing varieties are demands of sweet potato farmers. Shangqiu Sweet Potato No. 19 features beautiful appearance, good taste of cooked sweet potato, high yield, and high content of starch, making it become the major variety, realizing planting area accounting for more than 60% of local varieties.

1.5 Diversified planting modes In Fuyang City, sweet potato planting is mainly in two modes: spring cultivation and summer planting after wheat harvest. Other planting modes include intercropping between melon, vegetable and sweet potato, corn or sesame interplanting with sweet potato. "Starch, vermicelli and sheet jelly" processing type sweet potato industrial high efficient cultivation mode in Yingshang County is a typical sweet potato planting mode^[5]. Gengpeng, Sanshipu, and Shibalu of Yingshang County and Zhaomiao and Santang of Taihe County are famous sweet potato planting towns. Sweet potato planting and "starch, vermi-

celli and sheet jelly" processing and production are leading industry of these areas. The planting mode is partly monoculture of spring sweet potato, and partly rotation of wheat and sweet potato. Generally, planting households neither grow seedlings, nor store sweet potato, but only plant and process. Seedling growing and sweet potato sales are in the charge of special agricultural company or professional cooperatives, and sweet potato seeds are stored by large specialized households. According to processing characteristics of sweet potato industry, sweet potato processing generally chooses sweet potato varieties with high content of starch. Major planting varieties include Fuyang Sweet Potato No. 24, Shangqiu Sweet Potato No. 19 and Xuzhou Sweet Potato No. 22. Farmer households also can order special sweet potato seedling from large specialized storage or seedling households according to their own demands. Through the work division cooperative planting mode, the average yield of fresh sweet potato per unit area in Yingshang County reached 33 t/hm² in 2011. After processing to vermicelli, the output value per unit area exceeded 81 000 yuan/hm². Deducting costs, the net income of sweet potato in each hectare is up to 69 000 yuan.

2 Major development achievements of sweet potato industry in Fuyang City

2.1 Enriching varieties of agricultural and sideline products and promoting healthy diet

Sweet potato contains high nutritive value and is a type of healthy food recommended by the WHO. Nutrients of sweet potato, carotene, Vitamin B1, B2 and C, mineral substance such as Fe and Ca, are higher than rice and wheat flour. In history, Fuyang is often closely connected with natural disaster and poverty, and sweet potato has made remarkable contribution to Fuyang people. "Sweet potato dinner, sweet potato steamed bun, without sweet potato, you can't survive!" Sweet potato is always the staple food grain sustaining life for people in Fuyang region. After the Third Plenary Session of the Eleventh Party Central Committee, since rural policies of the party were suitable, grain production in Fuyang City advanced by leaps and bounds. In 1983, sweet potato in Fuyang City had a bumper harvest. "100 million kg sweet potato vermicelli looking for buyers" made Fuyang sweet potato and its processing products well-known in the whole country^[6-7]. In recent years, with improvement of living conditions, various "rich men's diseases" are of frequent occurrence due to excessive fine diet. Sweet potato can reduce cholesterol, reduce subcutaneous fat, has functions of neutralizing blood, ease constipation, improving immunity, anti-cancer, senile-resistance, and preventing artery sclerosis, thus it plays a significant role in promoting healthy diet of people.

2.2 Driving development of agricultural product processing industry and increasing employment rate of rural labor

As feed and industrial ethanol raw material, sweet potato has made great contribution to development of animal husbandry and processing industry of Fuyang City. In recent years, planting area of sweet potato decreases, and it nearly becomes food of rich people.

However, it is closely connected with people's living. Processing industries with sweet potato as raw material develop vigorously and become important parts of local economy. At Yaohai Agricultural Wholesale Market of Fuyang City, the annual sales volume of vermicelli is up to 13 000 tons. Yingshang County is a large county producing sweet potato in Fuyang City. Now, there are more than 400 starch, vermicelli and sheet jelly processing enterprises. Generally, their daily output of vermicelli is 5–6 tons, and 8 enterprises have daily output of 20–30 tons. Annual production time is about 5 months. Gengpeng Town is situated in southwest of Yingshang County, has 83 000 population, 5 700 hm² farmland, planting spring and summer sweet potato up to 3 500 hm², and there are more than 70 small starch, vermicelli and sheet jelly processing enterprises. Farmers' income from planting sweet potato accounts for 60% of crop cultivation, and takes up 40% of total agricultural income. In Gengpeng Township Industrial Park, Tianhao Food Company was built in 2010 with investment amount up to 7 million yuan. It has two vermicelli production lines with daily output of vermicelli up to 5 tons. It can process 5 million kg fresh sweet potatoes and produce 500 tons of vermicelli annually, with annual output value of 8 million yuan. It solves job problem of 40 people. In Gengpeng Town, there are 37 similar enterprises, with daily production of vermicelli 3–6 tons, providing 400 jobs at the same time.

2.3 Increasing financial revenue and rate of export-making foreign exchange of agricultural products Taihe County is a large sweet potato production county in north Fuyang. It has 1.712 million population and 115 000 hm² farmland, and the annual sweet potato planting area is up to 10 000 hm². Consumption structure of sweet potato is as follows: 30% for fresh food, 30% for starch, vermicelli and sheet jelly processing, 30% sold to southeast regions, and 10% for others. Dongfan Sweet Potato Professional Cooperative in Zhaomiao Town of Taihe County has annual sales volume of fresh sweet potato more than 8 million kg, which promotes development of sweet potato industry in local and surrounding regions. Also in Taihe County, Zishan Sweet Potato Professional Cooperative has annual total operating amount above 30 million yuan, realizing profit and tax amount higher than 2 million yuan. In Daxu Village of Gengpeng Town of Yingshang County, Kaixuan Food Company holds 42 workers and has daily output of 30 tons. Its products are sold to South Korea. The annual sales volume is up to 3 million kg, realizing profit and tax of 1 million yuan and daily income of a worker up to 260 yuan.

2.4 Increasing farmers' income and promoting new socialist countryside construction Fuyang is a large agricultural city abounding with sweet potato, and the sweet potato industry has made remarkable contribution to increase in farmers' income and new socialist countryside construction. Take Sanshipu Town of Yingshang County as an example, it includes 9 administrative villages and 1 community neighborhood committee, 52 600 population and 3 400 hm² farmland. In the whole country, the sweet potato planting area is up to 2 000 hm², annual yield of fresh sweet

potato up to 75 000 tons. From 1995, vermicelli processing with Renhe Village as the center started to turn to perennial and mechanical processing from winter processing and manual processing. By now, there are 148 sweet potato vermicelli processing factories, and a lot of farmer professional cooperatives are established, including Xinrenhe, Xinheyuan, Wanqi and Yongxiang Virus Removal Sweet Potato Planting. Among them, Xinheyuan and Yongxiang Virus Removal Sweet Potato Planting professional cooperatives have become leading enterprises at the city level. Wanqi, Xinheyuan and Tianfeng Food companies have submitted the application for city-level leading enterprise. The registered Xinheyuan, Wanqi, Wanbei Renjia (North Anhui People), and Tianfeng starch, vermicelli and sheet jelly brands have obtained food safety QS certification. Their products are sold in more than 20 provinces of China. The annual vermicelli processing volume is up to 38 000 tons with output value of 230 million yuan and profit of 40 million yuan. In addition, it solves job problem of more than 3 000 farmers, promotes local economic development, increases farmers' income^[8], and greatly drives new socialist countryside construction.

3 Comparative advantages and restrictive factors of sweet potato industry in Fuyang City

3.1 Comparative advantages of sweet potato industry in Fuyang City The sweet potato industry in Fuyang City has following comparative advantages. (1) Geographical environment: Temperate climate and fertile soil of Fuyang City are quite suitable for planting of sweet potato, bringing about high yield and quality. (2) Advantages of sweet potato: Sweet potato features high fertility endurance, barren resistance, and stress resistance, easy management, less fertilizer application, irrigation and pesticide. (3) Personnel advantage: Fuyang City is always a major production area of sweet potato. Fuyang farmers are familiar with sweet potato cultivation technology. Sweet potato industry in Fuyang has established relatively stable industrial chain. There are a lot of people engaged in production, processing and sales of sweet potato. People in Fuyang have high confidence in the sweet potato industry. (4) Policy advantage: Engagement in agricultural product processing can reduce or remit tax.

3.2 Restrictive factors of development of the sweet potato industry (1) Low mechanization level of sweet potato production impairs its development. In many places, the sweet potato cultivation and harvest are still mainly manual work. Large sweet potato planting households increase, thus mechanical requirement for sweet potato production becomes more urgent. Rise of high labor, difficult recruitment, old and sick left-behind people can hardly support production of sweet potato. (2) Seedling market is in chaos, and plant diseases and insect pests deteriorate. Since there are lots of new sweet potato professional households, who do not have experience in storage and seedling growing. However, increase in seedling demand leads to blind production of some seedling growers without considering quality. Some farmers run around here and there to pursue new, rate and special seedlings, leading

to spread of plant diseases and insect pests. (3) Water pollution resulted from sweet potato starch processing is increasingly worsening, and increases difficulty in sewage control. Some areas take impractical intervening measures. As a result, the development of sweet potato industry is influenced. (4) Few brands, low level and low added-value of sweet potato. Some enterprises forget what is right at the sight of profit and mix sweet potato starch with corn or cassava starch, which disrupt the market, lead to fluctuation of sweet potato price, and influence development of the sweet potato industry. Agriculture-related enterprises are not fully open to the outside world, invite little outside investment, and have low ability of direct financing ability^[9].

4 Recommendations for development of the sweet potato industry

(1) Strengthening research, demonstration and extension of sweet potato production machines.

(2) Regulating sweet potato seedling market, implementing market access system, and issuing seedling growing permit.

(3) Comprehensive controlling and dividing sewage discharge place, and researching chemical or biological degradation of sewage, to solve pollution problem resulted from starch, vermicelli and sheet jelly processing.

(4) Guiding enterprises to set up famous brands, strengthening enterprise credit management, setting the lowest sales and

purchase price, and ensuring benefits of links in the industrial chain.

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